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AN
Experimental Diſſertation
ON THE
RHUS VERNIX, RHUS RADICANS
AND
RHUS GLABRUM;

COMMONLY KNOWN IN PENNSYLVANIA BY THE NAMES OF

POISON-ASH, POISON-VINE AND COMMON SUMACH.

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AN

INAUGURAL DISSERTATION

FOR THE DEGREE OF

DOCTOR OF MEDICINE;

SUBMITTED TO THE EXAMINATION OF

THE REV. JOHN EWING, S. T. P. PROVOST;

THE

TRUSTEES AND MEDICAL FACULTY

OF THE

UNIVERSITY OF PENNSYLVANIA,

On the 22d day of May, 1798.

INTRODUCTION.

EVERY enlightened citizen ſhould be intereſted in the examination of the natural productions of his country. This obſervation applies with particular force to the United States of America, whoſe extenſive limits afford numerous opportunities, for diſcoveries and improvements in every branch of natural ſcience. A certain patriotic zeal *ought to animate every individual of this republic. As it is indiſpenſibly requiſite to the man, whoſe buſineſs it is to defend its political rights from infringement, ſo it ſhould ſtimulate that man likewiſe, whoſe time and talents are devoted, for the general intereſt of his country, to the more humble employment of inveſtigating its natural productions.*

In the choice of a ſubject for an Inaugural Diſſertation, my attention was early directed to the indigenous vegetables of the United States. After ſeveral months laborious reſearch, I regret, that I have been able to add but little to our knowledge of thoſe vegetables, which were the objects of my attention.

I wiſh thoſe experiments which are laid before the public in their preſent unfiniſhed ſtate, to be conſidered as an introduction to a ſeries of experiments, on the American ſpecies of the genus Rhus. Unacquainted with the ex-

tenſive nature of the ſubjects which are conſidered in the following pages, I found, after having made ſome progreſs in their examination, that the complete analyſis of each, individually, would afford more than ample employment for all the time that was at my command.

Perſons who have been engaged in ſimilar purſuits, are acquainted with the numerous hindrances, which retard the progreſs of the unexperienced experimenter. Every candid ſuggeſtion, from theſe, will be attended to with care, and acknowledged with gratitude.

To the Managers *and* Phyſicians *of the* PENNSYLVANIA HOSPITAL, *under whoſe parental patronage the author commenced and continues his medical ſtudies, the following diſſertation is* dedicated, *as a ſmall tribute of the eſteem and gratitude of an obliged pupil. This excellent inſtitution, while it perpetuates the benevolence of its original founders, reflects great honour on its preſent adminiſtrators. It is not erected, it is true, on the baſis of wealth or grandeur, but it is ſupported by the more ſolid and durable pillars of* ſcience *and* humanity. *It affords to numerous pupils, extenſive opportunities for improvement in the practical part of medical ſcience, and it is happily conducive to the relief of much human miſery.*

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EXPERIMENTAL DISSERTATION, &c.

DESCRIPTION *of the* RHUS VERNIX, RADICANS *and* GLABRUM.

THE plants which are the object of the ſucceeding experiments and reflections, belong to a numerous and extenſive family of vegetables. Different ſpecies of the genus *Rhus* are found in every quarter of the globe, and inhabit almoſt every climate.* Seven ſpecies of this genus have been diſcovered in Pennſylvania: the Rhus typhinum, R. copallinum, R. glabrum, R. canadenſe, R. vernix, R. toxicodendron and R. radicans.†

The three laſt ſpecies are moſt numerous in the ſouthern parts of the United States: the more temperate climate of the northern ſtates appears beſt adapted to the four ſpecies firſt enumerated.

Three other ſpecies of Rhus are found in the ſouthern regions of North-America: the Rhus elegans, aromaticum, and ſuaveolens.

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* Thirty-two ſpecies are enumerated in the laſt edition of the *Syſtema Vegetabilium* Linnæi, publiſhed by Gmelin.

† *Clayton*, in his Flora Virginiana, publiſhed 1762, deſcribes ſeven ſpecies.

My deſign, at preſent, is to deſcribe thoſe ſpecies, which in the ſubſequent pages, are the more immediate objects of my inveſtigation: the *Rhus Vernix*, the *Rhus radicans*, and the *Rhus glabrum*.

In the Linnæan ſyſtem of vegetables, the genus Rhus is arranged under the claſs *Pentandria*, and order *Trigynia*. Dr. Juſſieu, in his very learned and intereſting work, entitled *Genera plantarum ſecundum ordines naturales diſpoſita*, has placed it in the fourteenth claſs of *plantæ dicotyledones polypetalæ*, and twelfth order *Terebintaceæ*.

The following are the characteriſtic marks of this genus. The Perianth* is five-parted, beneath, erect and permanent. The Corol conſiſts of five petals, which are egg'd and a little ſpreading. The Filaments are five, very ſhort. The Anthers are ſmall, ſhorter than the corol. The Germ is above, roundiſh and of the ſize of the corol. The Styles are ſcarcely evident. The Pericarp a berry of one cell. The ſeed roundiſh and bony.

Moſt of our native ſpecies of Rhus, are not ſimply hermaphrodite: in ſeveral, the male and female flowers are found on different plants; others have male, female and hermaphrodite flowers on the ſame plant.*

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* Moſt of the Botanical terms, which occur in the deſcription of theſe plants, are taken from the tranſlation of the Syſtema Vegetabilium of Linnæus, by a Botanical Society at Litchfield.

1. The *Rhus Vernix.*

This tree is diſtinguiſhed in Pennſylvania by the different names of: Poiſon tree, Poiſon wood, Varniſh tree, Poiſon aſh, Swamp Sumach and white Sumach.†

The Rhus Vernix is the largeſt of all our native ſpecies of Rhus; it grows in ſome inſtances to the height of twenty-five or thirty feet; its average height, however, may be eſtimated at twelve or fifteen feet. It ſeldom exceeds five inches in diameter.

It delights in a fat ſoil, in low, marſhy places. It is generally found near creeks or rivulets, in dark and ſhaded ſituations. Two ſwamps, which I ſeveral times viſited, during the courſe of laſt ſummer, are the moſt deſert and gloomy places, which are to be found in the vicinity of Philadelphia. They are ac-

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* Walther, from this circumſtance, in his *Flora Caroliniana,* has placed the whole of this genus in Linnæus's claſs of Polygamia: he deſcribes five ſpecies.

† This is the Toxicodendron foliis alatis, fructu rhomboide of Dillenius. Hort. Elth.

Arbor americana, alatis foliis, ſucco lacteo venenato; Plukenetii Almageſt.

Sitz ſive Sitz-dsju; vulgo Urus ſeu Urus no ki.

Arbor vernicifera legitima, folio pinnato juglandis, fructu racemoſo ciceris facie. Kæmpferi amœn. exoticæ, p. 791, &c. vide appendix.

Several *varieties* of the R. Vernix are found in Pennſylvania, ceſſible with difficulty; and appear devoted by nature, to the habitation of injurious plants and venomous reptiles.

The common trunk of the Rhus Vernix, after arriving at the height of four or five feet, generally divides into two branches, which purſue for ſome diſtance, a regular oblique courſe. In ſome inſtances each of theſe branches is again divided in a two-fork'd manner; but in many caſes, they divide into four or five ſmaller branches, which are ſent off near each other circularly from the circumference of the parent branch, forming a regular verticill. Theſe ſmaller branches purſue the ſame oblique courſe, and are again ſubdivided, into a number of verticills (or umbells) of branches, which finally ſend off long, ſappy, luxuriant ſhoots, and are terminated by a thick circular cluſter of leaves.

This ſingular diſpoſition of the branches, gives the tree a very elegant appearance. In ſome inſtances the ſubdiviſions are perfectly regular; all the ſmaller branches proceed from a main branch in an oblique direction, and give the tree a circularly ſpreading appearance, highly pleaſing to the eye.

The trunk is frequently erect; in ſome inſtances it proceeds from the ground in an oblique inclining direction; three or four trunks ſometimes ariſe from one root. The bark of the trunk is of a dark grey colour; in the upper branches the colour is lighter. The bark of the young trees is generally ſmooth, it becomes rough and furrowed as they advance in age. The wood is light, brittle, and of a ſpongy texture; the younger branches are tubular and contain much pith. They can eaſily be made hollow, and have been uſed by the natives, in making flutes or whiſtles;* they are alſo employed in the preparation of their calumet or pipe of peace.

It has been an opinion, which at one time was pretty generally received, and which has been copied from one deſcription of the tree into another, that the wood when touched, imparted to the hand an evident ſenſation of *cold*; and that by this circumſtance alone, it might be diſtinguiſhed from every other tree of the foreſt. This appears to be a vulgar prejudice, originating from a certain degree of terror, which is always aſſociated with this tree.† I have frequently touched it, with a view to be made ſenſible of this coldneſs; but I never found it to differ in the ſmalleſt degree in temperature, from the trees in its vicinity.

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* Kalm.

† "My neighbour (ſays Dudley, Philoſ. Tranſact. 1720) that was ſo ſadly poyſoned with handling it, told me one thing very remarkable of the wood; (of R. Vern.) and that is, that when he touched it, he plainly perceived it to differ from the other wood, that he was throwing up into his cart; for it was as cold as a piece of ice; and withal aſſured me, he could diſtinguiſh it blindfold, or in the dark, from any other wood in the world, by its coldneſs; *but the poor man is as much afraid of it, when he goes into the woods, as of a rattle ſnake.*"

The leaves break forth about the beginning of May; at their firſt appearance they are of a cupreous, or of a dark yellow colour; after being fully expanded, their ſuperior aſſumes a lively deep green colour, while their inferior ſurface is conſiderably paler. The leaves are compound: each leaf conſiſts of four or five pair of pinnæ (is five-feathered or winged) which are placed oppoſite, on very ſhort petioles, and are terminated by an odd one.* The ſeparate leaflets are ſmooth, intire, egg'd, and terminate in an acute ſomewhat elongated point. They are divided into two equal parts by a nerve, which is continued from their ſeparate petiole in a ſtraight courſe through the leaflet, and from which a number of ſmaller nerves run to its margin. The common petioles and the nerves of the leaves, are frequently of an elegant red colour. In ſome inſtances the leaves are ſlightly ſinuated near their point: and in a few caſes I have obſerved their inferior ſurface, covered with a ſlight down.

They are of a ſtrong tough conſiſtence. Linnæus's ſpecific character of the Vernix is: *leaves feather'd moſt intire annual opake, petiole intire equal.*

The flowers make their appearance, in the neighbourhood of Philadelphia, during the firſt or ſecond week of June; in the more northern parts of Pennſylvania, I have found the tree in bloſſom during the firſt days of July. The flowers are arranged in ſmall ſeparate racemes, which form, at the termination of a long common peduncle, an interrupted panicle (of flowers) of conſiderable length. The peduncles with the terminating panicles, frequently extend to the length of ſix or ſeven inches. The peduncles always originate from the ſmaller branches, at the baſis of a common petiole of the leaves, by which they are ſurrounded and ſupported. The flowers are chiefly produced near the end of the branches, where they exiſt in great abundance; they are arranged in common with the leaves that ſupport them, circularly around the leſſer branches, forming, when the tree is in bloſſom, a beautiful globular cluſter of leaves and flowers. They are very ſmall and of a yellowiſh or herbaceous colour. Their odour is very agreeable, and during the flowering of the tree, they attract innumerable ſwarms of bees; I have never heard that the honey collected from them, is ſuppoſed to poſſeſs any deleterious quality.

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* The number of wings varies conſiderably; in ſome inſtances I have found three, in others ſix or ſeven.

The male and female flowers of the R. Vernix (like thoſe of ſeveral other ſpecies of Rhus) are in moſt caſes, produced on different plants: I have not perceived any difference in the growth of the male and female trees.

The flowers are ſucceeded, on the female plants, by ſeeds which are arranged on their panicles, in the ſame manner as the bloſſoms; they ſomewhat reſemble bunches of ſmall grapes, and are ripe about the middle of October. The ſeeds are not perfectly globular, but a little compreſſed. They are ſurrounded in their dry ſtate by a thin light green cortical covering, which before they become dry, contains a pulpy ſubſtance; when this exterior thin ſhell is removed, the compreſſion is more evident, and the ſeeds appear ſtriated. They are of a yellowiſh colour, and about one fourth part of the ſize of one of our common peas. They are very hard, and when broken, are found to contain a ſmall yellow kernel of an oleaginous nature.*

The roots of the R. Vernix are large, irregular and knotty; they generally run ſome diſtance near the ſurface of the ground.

To determine the queſtion: whether the tree which has been deſcribed in the preceding pages, be the ſame with that, from which the famous varniſh of ſeveral oriental countries is obtained? has, at different times, been an object of attention, among Botaniſts of the firſt reputation. The oriental Varniſh-tree has been deſcribed with great accuracy by Kæmpfer, in his *Amœnitates exoticæ*. (Of this deſcription an extract is given in the appendix.)

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* "Candles, which are burned on particular feſtival days in *Japan*, are prepared of an oil procured by expreſſion or decoction from the ſeed of the Rhus Vernix and R. ſuccedanea; the latter of which grows in many diſtricts of Japan, and produces a great quantity of ſeed. The expreſſed oil of the ſeeds of the R. ſuccedanea is alſo uſed by the Japaneſe in preparing their victuals." Thunberg's travels.

From a very accurate compariſon of Kæmpfer's deſcription of the Varniſh-tree of the Japaneſe, with the R. Vernix of our country, and from frequent compariſons of the leaves of our R. Vernix, which I procured from different parts of Pennſylvania, with Kæmpfer's figure of the Vernix of Japan, I am fully convinced that they are identically the ſame.

This opinion was alſo entertained by Linnæus, Miller, Dillenius, Clayton and Thunberg.

To trace the ſimilarity of our Varniſh-tree, with that deſcribed by Kæmpfer, in all their different parts, would lead to a tedious prolixity.*

A long and acrimonious controverſy, concerning this ſubject, was carried on, about forty years ago, between Mr. Philip Miller and Mr. John Ellis.† The former contended for the ſameneſs of the American Varniſh-tree with that of Japan; which the latter poſitively denied. To relate, in this place, the different opinions and arguments, which were adduced on both ſides of the queſtion, would be neither intereſting nor inſtructive. I have peruſed their different papers with much attention, but I find nothing in them to induce me to change the opinion above advanced. The diſpute certainly was carried on under very unfavourable circumſtances: the difficulty of procuring ſpecimens from foreign countries; the imperfection or fallacy of ſpecimens when procured; and the variations, to which vegetables naturally are ſubject, when removed from their native ſoil to diſtant and unaccommodated climates, has led them, on both ſides, into many inaccuracies and miſtakes. Every perſon, acquainted with Botany, who has ſeen the trees in their native countries, will readily diſcover the ſources of their deception. It is to be regretted, that while the plants concerning which they differed in opinion, were natives of Japan and North-America, their controverſy was unfortunately carried on in Great-Britain.

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* Dillenius, in his deſcription of the R. Vernix, remarks: "It ſhould not ſeem ſtrange, that the Varniſh-tree ſhould be found in America near the ſame latitude with Japan; ſince the Ginſeng, the Bignonia, commonly called Catalpa, with many other plants, are found to be natives of theſe countries. And I queſtion, if the Tea-tree might not be diſcovered in America, if perſons of ſkill were to ſearch for it."

† See London Philoſ. Tranſact. Vols. 49 and 50.

One of my chief objects, in inveſtigating the properties of our R. Vernix, was to determine, whether it contained the ſame ſingular varniſh-like juice, which is obtained from this tree in Japan; and whether this juice might be employed with advantage, by our artiſts, in the preparation of varniſhes.

My firſt trials were inſtituted at that ſeaſon of the year, when in trees of a ſimilar growth, the ſap or juice is found in greateſt abundance. During the firſt week of May, on a warm day, I made a number of circular inciſions into the bark of a tree of moderate ſize; theſe inciſions were immediately followed by a very copious flow of a viſcid fluid, which at firſt was of a white or light yellow colour, but which upon a ſhort expoſure to the air, became brown, and in ſome inſtances nearly black.* I was able in the courſe of about half an hour, to collect from this tree, half an ounce of its juice. I made ſimilar inciſions into ſeveral other trees, in the neighbourhood of the firſt; and by repeated collections on different days, I obtained ſeveral ounces of this varniſh.

If the veſſel in which this juice has been collected, is immediately cloſed, it retains its original white or yellowiſh colour, and becomes brown only on that ſurface, which is in contact with the air. The juice has a ſweet, but ſomewhat diſagreeable odour; it is viſcid,† gliſtering and pellucid; its taſte is acrid; it imparts when freſh, a ſlight ſenſation of heat to the tongue, and when ſwallowed irritates the fauces and excites coughing. It appears to agree in every particular, with that deſcribed by Kæmpfer, as flowing from the Varniſh-tree of Japan.

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* The juice which accidentally exſudes from the tree and dries on its bark, always aſſumes a jet black colour.

† "From the Toxicodendron, when wounded, iſſues a great quantity of juice, which when expoſed to the heat of the ſun, turns ſo very clammy, that it proves a good birdlime, and is with great ſucceſs made uſe of for that purpoſe." Hughes's Natural Hiſtory of Barbadoes.

About the middle of May, when the leaves are fully expanded, I perceived that the juice flowed leſs copiouſly out of inciſions into the bark; its quantity gradually diminiſhed, and during the firſt week of June, the decreaſe was very evident. I found, however, by frequent trials, that at every period of the year, from May till September, ſome juice always followed an inciſion into the bark.*

My next object ſhould have been to determine the application of this juice, to the art of varniſhing: this I have not been able to accompliſh. The inveſtigation of ſome of the properties of ſeveral other ſpecies of Rhus, engaged all the time I could devote to theſe purſuits. Perhaps I would have been more uſefully employed in determining the properties of this varniſh. From its very great analogy to the oriental varniſh deſcribed by Kæmpfer, it is evident that it promiſes conſiderable utility in the art of varniſhing: it is a matter of importance, and will be the object of ſome of my future reſearches.

2. *The Rhus Radicans.*

This plant is generally known in the United States, by the name of *Poiſon-Vine*; in ſome parts of Pennſylvania it is called Poiſon-Creeper.† It grows only in a fertile ſoil; but is capable of exiſting in different ſituations; ſometimes it is found near rivulets, at others in dry and elevated places.

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* The juice flows more copiouſly after wet weather.

† This is the Toxicodendron triphyllon glabrum; Tournefort. inſtitut.

Hedera trifolia canadenſis; Cornuti.

The Rhus radicans has a ſlender aſcending ſtem, which ſupports itſelf on the bodies in its vicinity. Like various ſpecies of Ivy, it frequently climbs up to the top of our talleſt trees, arriving at the height of forty or fifty feet. It appears to delight in aſcending the lofty oak trees, which ſurround the fields of our farmers. Very often it is met with along the ſides of fences, which ſerve it as a very convenient ſupport. Its ſtem rarely exceeds two or three inches in thickneſs; in a few plants which were growing in a very fertile ſoil, I have ſeen it nearly five inches in diameter. The ſtem in many caſes is compreſſed on the ſides; ſometimes it is interrupted by ſmall tubercles. It is covered with a grey bark, which in young plants is of a lighter colour.

If the R. radicans happens to grow in ſituations, where it meets not with a ſupport, it never exceeds four or five feet in height; in theſe inſtances its growth is always winding or oblique; its branches frequently return and creep along the ground. In ſome caſes it is forced to purſue this procumbent

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Dillenius's Toxicodendron rectum, foliis minoribus glabris, is a variety of our Rhus glabrum.

The Delaware Indian name is *Pu-tſchis-ktey*. D. Zeiſberger's ſpelling book.

I have obſerved ſeveral varieties of this ſpecies of Rhus.

courſe for a conſiderable diſtance, without exceeding two or three feet in height.

In order to attach itſelf in its aſcent, to trees and other ſubſtances, the ſtem and branches of the Rhus radicans are furniſhed with a great number of long, thin, threadform radicles or tendrils; which proceed in abundance from almoſt every part of the ſtem and branches. It is from theſe numerous radicles, that it has obtained its ſpecific name of *radicans* or rooting.* By means of theſe radicles it ſometimes adheres with ſo much force to the neighbouring bodies, that it is difficult, and not unfrequently impoſſible to detach, without breaking it. I have frequently ſeen large plants, ſo completely enveloped with a thick coat of theſe tendrils, that no part of their bark was viſible.

From the bark of the R. radicans, when it is wounded, exſudes plentifully a milky juice: in proportion to the ſize of the plants, it appears to flow as copiouſly from the Rhus radicans, as it does from the Vernix. After a few hours expoſure to the air, it takes on an intenſely *black* colour; in its other properties it reſembles the juice obtained from the R. Vernix. Its taſte is acrid and ſomewhat aromatic. A ſimilar juice exſudes from the leaves, immediately after being detached from the plant; this juice has been employed in a few experiments, which will be related in a ſubſequent part of this diſſertation.*

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* In very young plants theſe radicles frequently are of a beautiful crimſon colour.

The trunk of the Rhus radicans, almoſt during its whole courſe, ſends off lateral branches in an oblique or rectangular direction; which frequently proceed to the diſtance of two or three feet, and in their courſe again ſend off a number of leſſer branches. The ſmaller branches are very ſlender and frequently pendulous. This arrangement of the branches, gives the plant, where it ſtands expoſed to view, an irregular and buſhy appearance.

If it grows in ſituations, where it is ſupported for a ſmall diſtance only, it ſends off, near the top, numerous branches, which ſpread irregularly in various directions.

The Rhus radicans frequently purſues a ſpiral courſe around its neighbouring trees; it is frequently intwined in a beautiful manner, with our Hedera quinquefolia.

Its wood is brittle, but more firm than the wood of the Vernix.

The leaves of the Rhus radicans, are trifoliate (three'd;) the common petiole, on the larger plants, is ſeveral inches in length. The two lateral leaflets are ſupported by very ſhort petioles; while that of the terminating leaflet is ſomewhat longer. The leaves generally are intire, egg'd, ſmooth and terminated by an acute point; they are divided, in the middle, by a prominent nerve. But I know few plants, the form of whoſe leaves is ſo various: ſometimes they are pretty regularly ſaw'd, at others irregularly ſinuous; in ſome inſtances they are nearly oval, in others they are lance-ſhaped. According to Linnæus's ſpecific character the leaves are: "*three'd: leaflets petioled, egg'd, naked, moſt intire.*" When they firſt appear in ſpring,* they are of ſhining red or of a copper colour; after having arrived at perfection, their ſuperior ſurface is of a light green colour, which is paler beneath. They are thin and of a weak texture. When dried, and preſerved in a box, they have a very agreeable odour, very much reſembling that of Bohea-tea.

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* When the bark of the R. radicans is burned, it emits a ſmell reſembling that of burning cheſnuts or caſhew-nuts.

I have been informed, by Dr. Barton, that the leaves are eaten by horſes, with impunity; they are alſo eaten by cows; and ſheep (according to Profeſſor Thunberg, in his travels) eat the leaves of a ſimilar ſpecies, the Rhus lucidum. Horſes, Mr. William Bartram informs me, are very fond of the leaves of the Rhus toxicodendron.

The flowers are produced along the whole courſe of the leſſer branches; they moſtly originate at the baſis, and juſt within the common petiole of a leaf, though many of their peduncles are ſent off ſeparately. Their peduncles are very ſhort, and their paniclts are leſs complex than thoſe of the R. Vernix; about fifteen or twenty flowers are generally ſupported by one common peduncle. The flowers are ſmall, and their petals of a light-yellow colour.* They have a moſt delightful odour, which reſembles, but far exceeds in ſuavity, the odour of the Reſeda odorata.

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* In the vicinity of Philadelphia about the latter end of April, in the back parts of Pennſylvania, later.

The male and female flowers are generally produced on different plants.

Irregularly round, ſtriated berries, of a green colour, ſucceed the female flowers; they contain a ſmall hard ſeed, which is laterally compreſſed. They ripen about the beginning of October. The ſeeds are very permanent, and frequently adhere to the branches, in a dry ſtate, during the courſe of a whole year.

The roots of the R. radicans are ſlender; they run near the ſurface of the ground, and in their courſe, ſend forth a number of young plants.

3. *The Rhus glabrum, common Sumach or ſmooth Pennſylvanian Sumach.*

This plant is found abundantly in almoſt every part of Pennſylvania. It grows in a looſe, fertile ſoil; frequently upon vacant or uncultivated fields, and along the ſides of roads and fences. It ſometimes riſes to the height of eight or ten feet; in many inſtances it does not exceed four or five feet.

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* They appear about the beginning of June.

The trunk of the Rhus glabrum is ſeldom erect ; after riſing in an incurvated or oblique direction, to the height of two or three feet, it divides into ſeveral large branches.

The ſmall branches, which they ſend off, are diſpoſed in ſuch a manner, as to form numerous, irregular oblique angles. They are covered with a ſmooth light grey or reddiſh bark, containing a viſcid, gloſſy, yellow juice, which is not changed upon expoſure to the air. The wood is very light. The leaves, like thoſe of the Vernix, are compound ; each leaf conſiſts of nine or ten pair of leaflets or wings, which are placed oppoſite, and are terminated by an odd one.

The leaflets are ſmooth, lanced, ſawed and acute ; the Linnæan ſpecific character is : *leaves feather'd ſaw'd, lanced, naked on both ſides*. It is ſaid, the leaves when dried, are mixed by the Indians with the tobacco they uſe in ſmoking.

The leaves which in ſummer are of a deep green colour, change to a beautiful red, in autumn ; hence, what Kæmpfer elegantly remarks of the ſpurious Varniſh-tree of Japan, may with ſtrict propriety be applied to the R. glabrum : “ *Rubore ſuo autumnali, quo viridantes ſylvas ſuaviter interpolat, intuentium oculos elonginquo in ſe convertit.*”

The flowers are produced in large, erect, compound thyrſes, at the termination of the ſuperior branches. They are of an herbaceous colour. They appear about the beginning of July.

The ſeeds are arranged, like the flowers, in large conical thyrſes. They are of a dark red colour; and after their arrival to maturity, early in autumn, covered with a white tenacious powder, of an agreeable acid taſte. The berries with their ſaline covering, have been ſubjected to ſeveral experiments, which will be related in a ſubſequent part of this diſſertation. From this white, ſaline powder, which is found on the berries, the Rhus glabrum has been called, in various parts of Pennſylvania, *Indian Salt*.*

Of the POISONOUS QUALITY *of* SEVERAL SPECIES *of* RHUS.

My obſervations under this head, apply chiefly to the Rhus radicans and the Rhus Vernix. Theſe two plants in conſequence of the deleterious effect they produce on the ſkin, and by means of it on other parts of the human body, have been called *poiſons*; the former, as if it claimed that name in preference to all other ſubſtances, is called in ſome parts of Pennſylvania, *the* poiſon; and both formerly belonged to a genus denominated in ſyſtems of Botany, *Toxicodendron*.

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* "Indigenæ hac ſubſtantia ad carnes condiendas utuntur." Schœpf.

"The ſeed of a certain ſpecies of Rhus, was formerly uſed, according to Pliny, for ſeaſoning meat, inſtead of ſalt; and was thought to render all fleſh-meat more ſavory and grateful to the palate." James's Med. Dict.

"The berries are uſed as a mordant, or fixer, for the red colour with which the Indians dye their porcupine quills."

Dr. Barton's Collect. to a m. m. of the U. S.

As I ſhall have frequent occaſion, in the courſe of the following obſervations, to uſe the term poiſon, it may be proper to remark, that with phyſicians and naturaliſts this term ought to be conſidered as entirely of a relative nature. The moſt innocent and ſalubrious ſubſtances, may at certain times and in improper doſes, produce effects ſimilar to thoſe generally aſcribed to poiſons; while the moſt active or injurious ſubſtances, ſuch as opium or arſenic, adminiſtered at a proper time and in proper doſes, produce the moſt beneficial effects.

Poiſons according to their different nature, affect different parts of the human body: ſome, as ſtramonium and ſeveral other narcotic vegetables, appear to act chiefly on the brain; others act ſpecifically on the blood, for inſtance the poiſon of the viper; ſome act primarily on the lymphatics; while others as opium, hyoſciamus and the contagions* of the plague and yellow fever, may be conſidered as univerſal poiſons, which exert their influence on every part of the human body.

A large proportion of poiſons, belong to that claſs of the Materia Medica, which has been happily called by Dr. Darwin *Incitantia*. The articles of this claſs *incite* the motions of the different parts of the human ſyſtem; they produce an increaſe of the action of the heart and arteries, increaſed ſecretions of the glands and viſcera, and exceſs or irregularity in the action of the organs of ſenſation and thought: effects which are analogous to the operation of the following well known articles of the materia medica: opium, electricity, alcohol. This inciting effect is produced in a peculiar manner, on the *cutaneous ſyſtem*, by the Rhus Radicans and the Rhus Vernix, which have been ranked with propriety among the *topical* incitants.*

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* Dr. Ruſh's Lectures.

In treating of the poiſonous property of theſe two plants, I ſhall firſt enumerate the various methods in which their effects are communicated to the human body; I ſhall then deſcribe the morbid ſymptoms which are produced by them; and laſtly, I ſhall mention the remedies by which theſe ſymptoms are obviated, or cured.

Ever ſince theſe plants have attracted the notice of naturaliſts and of other perſons, it has been obſerved, that the ſuſceptibility of receiving their poiſonous influence, exiſts in different conſtitutions in very different degrees. While ſome are affected with a cutaneous eruption by their exhalation, at the diſtance of twenty feet, others are not affected by freely handling them, or by applying their juice to the tongue and fauces.

The cauſe of the different prediſpoſition to this eruption, has never been ſatisfactorily explained. Irritable habits, it has been obſerved, are more liable to be poiſoned than others; yet, even among perſons, whoſe irritability is nearly alike, the tendency to be acted upon by this poiſon, is very various.

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* Dr. Barton.

The following circumſtances have conſiderable influence, in varying, in the ſame perſon, the aptitude to the reception of the poiſon.

1. A warm or cold climate; "In the ſouthern climates theſe plants are more active than in the northern."*

2. Different ſeaſons of the year; this I have very ſtrikingly experienced in my own caſe. The Rhus Vernix never affects me in the ſmalleſt degree, except on very hot days in ſummer.†

3. Infancy or manhood; Dr. Barton has remarked, that children are more readily poiſoned than adults; ſeveral inſtances in proof of this, have fallen under my own obſervation.‡

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* Dr. Barton.

† "They are more active in ſpring and ſummer, than in autumn and winter." Wangenheim, von den Nordamerikaniſche Holzarten. Gœttingen, 1787.

‡ This I believe is the caſe with moſt other cutaneous diſeaſe An intelligent perſon informed me, that during his infancy, h was very eaſily infected by the itch; but, that ſince his arrival manhood, he is, upon expoſure, much leſs readily affected by th diſeaſe. I alſo met with a perſon, who in early life was readil poiſoned, by the common Rue of our gardens, in whom this plan produced no effect, after having advanced in age.

4. Expoſure before or after a meal; "Theſe plants more readily poiſon immediately after than before a full meal."[*]

5. The preſence of moiſture; it is very generally believed, by inhabitants of the country, that the effluvia of the plants, when combined with moiſture, are moſt apt to produce the eruption. According to ſeveral facts which I have collected, this opinion deſerves credit. It requires to be further inveſtigated.[†]

6. A ſtate of increaſed perſpiration, at the time of expoſure to the poiſon, has a moſt powerful influence, in rendering perſons more ſuſceptible of the eruption. Of this I had ſeveral unequivocal proofs during the courſe of laſt ſummer; in collecting the juice of the Rhus Vernix, if I was in a ſtate of high perſpiration at the time, I never failed to be affected, more or leſs, with the eruption; if my ſkin was perfectly dry, the poiſon produced not the leaſt effect upon me. Profeſſor Kalm remarked the ſame during his travels; ſpeaking of the Rhus Vernix, he ſays: "I found,

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[*] Dr. Barton.

[†] That moiſture does not deſtroy their poiſonous quality, apears by the following quotation from *Fontana on poiſons*, v. 2. Fontana in order to examine the air of the leaves of the Toxicoendron, as he knew that he was eaſily poiſoned, obſerves: "I auſed them to be got ready by another perſon, but I touched a ew of the leaves when *under water*. In four days my face and yes ſwelled, &c."

however, that it could not exert its power upon me, when I was not perſpiring."

Females, Dr. Barton has obſerved, are more eaſily affected than males.

Of the different ſpecies of Rhus, which are natives of the United States, three are conſidered poiſonous. They vary in their degree of activity. The Rhus Vernix is the moſt violent, and the moſt univerſal in its effects: the toxicodendron and radicans, though they reſemble it, poſſeſs the poiſonous property in an inferior degree: many perſons who are never poiſoned by the radicans, are eaſily affected by the vernix. From a number of obſervations and facts, I am inclined to believe, that with the exiſtence of certain circumſtances, ſuch as warm weather, and a ſtate of high perſpiration, no perſon would be found entirely inſuſceptible of the poiſonous influence of the Rhus Vernix.

The manner in which the eruption is excited, like its degrees of violence, is ſubject to many variations. It is moſtly produced by one of the following circumſtances:

1. By the exhalation or effluvium of the plants. Although this may be queſtioned by perſons, who have not had an opportunity of obſerving their effects, yet, the facts in proof of it are ſo numerous, and many of them ſo decided and unequivocal, that not the leaſt doubt is to be entertained on the ſubject. Dr. Barton and Dr. Woodhouſe both informed me,

that they had been poiſoned in this manner. In theſe caſes the firſt ſymptoms frequently ſhew themſelves on the face and hands: but, though the poiſon appears to be applied principally to theſe, yet its effects in moſt inſtances, ſoon become general. To what diſtance the exhalation is capable of extending its influence, I have not been able accurately to determine. My obſervations lead me to believe, that in very excitable habits, it extends at leaſt to fifteen or twenty feet.*

A ſecond method is: the *ſmoke* of the burning wood. This circumſtance is pretty generally known, and I believe generally admitted. Several facts in proof of it, were communicated to the royal ſociety of London, by Dr. Sherard and Mr. Dudley, before the year 1720.†

It is alſo noticed by Kalm in his travels and by Wangenheim.

From ſeveral obſervations, I am induced to believe, that the effect in theſe inſtances, does not depend ſimply upon the ſmoke of theſe plants, but, that the particular part, in which the poiſonous quality conſiſts, is volatilized by the application of heat, and ſpreads its influence in every direction. Perſons frequently are poiſoned by ſitting near a fire, in which ſome of the wood of either ſpecies is burning, without the leaſt particle of ſmoke coming in contact with any part of their body.

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* Some authors aſcribe the poiſonous effect to the *ſcent* of the plants; this appears to be a miſtake; the odour, eſpecially of the radicans, is by no means ſtrong, it is ſcarcely perceptible when a perſon is in contact with the plant, nor is any ſpecific effect produced on the Schneiderian membrane.

† Philoſ. Tranſact, Abr. v. 6. p. 307 and 308.

Dr. Cooper was poiſoned by the ſteam ariſing from a decoction of the Rhus radicans.

3. By the actual *contact* of the leaves, ſtem or branches of the plants: in this manner, I believe, the eruption is moſt generally excited.*

4. By the immediate application of the *juice* of the plants, to the external ſurface of the ſkin, or by introducing it by inoculation, within the cuticle. In ſome perſons, who can handle the leaves and branches without injury, the eruption is excited by the application of the juice to any part of the ſkin.† That the poiſon can be communicated by inoculation, was firſt demonſtrated by an experiment made by Dr. Barton, during the laſt ſpring. I was ſince led by accident, to obſerve the production of the diſeaſe, by the inſertion of a very ſmall quantity of the juice, between

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* Mr. N. Jones informed me, that he knew a numerous company of boys to be poiſoned, by their uſing a ſtick, cut from the Rhus Vernix, in playing at ball.

† Its application to the cuticle in the palms of the hands, is in ſome caſes, an exception to this rule; in one inſtance, the juice being applied to theſe parts did not produce any effect, till it was communicated by contact to other parts of the body.

the cuticle and cutis. In two or three inſtances I obſerved a ſlight eruption, after phlebotomy, with a lancet, the quantity of juice communicated by which, muſt have been ſo very minute, as to render it ſcarcely conceivable, how the eruption was excited. (The peculiar ſymptoms, produced by inoculation, will be detailed hereafter.)

In illuſtration of the foregoing poſitions, many facts might be related, but this would lead to a prolixity, perfectly inconſiſtent with the deſign of this diſſertation.

The particular part of theſe plants, in which this deleterious property reſides, appears to be their *juice*, which as was obſerved in the hiſtory of their growth, exſudes plentifully out of inciſions made into the bark. This juice is highly acrid and corroſive; which is evident from its application to the ſkin of perſons, who are not liable to be affected by the plants; in theſe caſes it uniformly produces, like nitrous acid, or lunar cauſtic, a deſtruction and deſquamation of the cuticle. It is capable of being volatilized by heat; and during the life and vigour of the plant, it appears to be exhaled, in form of a peculiar gaſeous fluid poſſeſſing its ſpecific qualities, ſurrounding and defending the plant by an *atmoſphere of poiſon.*

The manner in which thoſe different ſymptoms are produced, which will ſoon be deſcribed, I have not had an opportunity of examining with ſufficient accuracy. It will appear evident from a review of theſe ſymptoms, that the poiſon induces in the veſſels of the ſkin a peculiar morbid action; an inflammation *ſui generis*. This inflammatory action exiſts in different degrees: in ſome inſtances the poiſon produces merely an eryſipelatous eruption, which in others advances to effuſion, to ſuppuration and to ulceration.

This I acknowledge is ſpeaking only in very general terms; it is repeating what muſt be obvious to every perſon who examines the diſeaſe with attention. At preſent, however, I have neither time nor inclination to ſpeculate on the pathology of this ſingular cutaneous affection. The ſubject is open for further inveſtigation.

I proceed now to the deſcription of the *ſymptoms* which occur, upon expoſure to the poiſon, in any of the methods above enumerated; and, in the firſt place, I ſhall deſcribe them, as they appear in perſons but moderately diſpoſed to the diſeaſe. The interval of time, between the expoſure and the appearance of the poiſonous eruption, is various. It depends in a great meaſure upon the diſpoſition of the perſon to be acted upon by the poiſon. In certain habits the effects appear in a few hours, in others not till in as many days.

A ſlight degree of itching, or a ſenſation of heat, is the firſt harbinger of the approach of the eruption;

this itching gradually increaſes, and is followed by redneſs and inflammation of the ſkin, which in ſome inſtances is very extenſive, and in others is confined to round circumſcribed ſpots, or to longitudinal ſtreaks. The inflamed parts now become ſomewhat elevated and tumefied; ſmall veſicles appear on their ſurface, containing a pellucid fluid, which gradually increaſe in ſize. The fluid ſoon becomes yellow, and after ſome time, takes on the colour and conſiſtence of pus. The veſications in ſome caſes are found ſeparate, but where the inflammation has been violent, their number is moſtly ſo conſiderable, that they come into contact, run into one another, and cover a conſiderable ſpace. After the veſications are completely diſtended, they break, and ſome of their pus being diſcharged, by drying on their ſurface, forms a yellow incruſtation.* In this ſtate if the veſicle is ſingle, it ſomewhat reſembles a puſtule of the ſmall pox: but where the veſications have been numerous, their purulent ſurface is proportionably extenſive; ſo that towards the end of the diſeaſe, large ſurfaces are covered with a yellow incruſtation, which in a ſhort time becomes brown. The diſeaſe generally terminates by a deſquamation of this cruſt, which leaves the ſkin very tender and of a florid red colour.* A very troubleſome itching accompanies the whole courſe of the eruption. It is very ſeldom that ſcars remain after its diſappearance. Four or five days are generally required for the eruption to paſs through theſe different ſtages.

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* If the veſications be irritated by ſcratching or by friction, large quantities of ſerum or pus are diſcharged from them; the incruſtations in theſe caſes are formed ſooner, but are leſs regular on their ſurface.

Somewhat like this is the common courſe of the diſeaſe when left to itſelf; but, like all other diſeaſes, it is in its progreſs ſubject to innumerable variations. Theſe depend, in a very great degree, on the habit of the perſon affected. By the application of the remedies which are to be mentioned hereafter, its progreſs in moderate caſes, can be prevented; and in violent caſes the ſymptoms may be much relieved and their period ſhortened.

I now proceed in tracing the hiſtory and ſymptoms of this diſeaſe; and in the firſt place, I ſhall mention ſeveral deviations from its uſual courſe.

1. In many caſes, although the diſeaſe does not exiſt in a violent degree, yet it is not terminated by paſſing through the ſeveral ſtages above enumerated. The eruption being excited in one part, is often propagated to the part lying contiguous to it, from whence by ſlow degrees, it paſſes in ſome inſtances, through the whole cutaneous ſyſtem. Thus there

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* If the eruption has been very ſlight, or if it has been ſtopt in its progreſs by the early application of proper remedies, ſtill the cuticle of the affected parts, is univerſally thrown off.

exiſts in different parts of the body, a conſtant ſucceſſion of ſeparate eruptions paſſing through their ſeveral ſtages.

2. The itching and the veſications which take place in the incipient ſtage of the eruption, frequently diſappear and return ſeveral times ſucceſſively. In ſome inſtances puſtules of conſiderable ſize, are entirely reabſorbed.

3. The poiſon appears to have a peculiar capricious diſpoſition, to attack particular parts; in moſt perſons the *eyes* are ſpecifically affected; in ſome the body, the legs or thighs. A peculiar and diſtreſſing itching of the *ſcrotum* and of the præputium penis, is one of the moſt general and characteriſtic ſymptoms of the diſeaſe, which in males, I have found to take place in every inſtance that has fallen under my notice, with but *one* exception. In quibuſdam occurrit erectio penis. An fœminis labia pudendæ ſimiliter affectantur? Its peculiar tendency to affect the eyes, is moſt ſtrikingly obſerved in perſons that are readily ſuſceptible of the eruption; in moſt of theſe, if its progreſs is not oppoſed by proper remedies, blindneſs of a longer or ſhorter continuance, is the certain conſequence.*

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* Although I am but little diſpoſed to the eruption, yet whenever the ſmalleſt degree of it is excited in me, my eyes are primarily affected: a ſlight tumefaction of the eyelids and of the ſkin immediately below the eyes, takes place, this is accompanied

It has been obſerved that the eruption, when it is re-excited, has a particular diſpoſition to affect again the ſame parts, that were formerly affected.

In habits which are very ſuſceptible of the poiſon, the ſame ſymptoms occur, which were above enumerated; but they make their appearance earlier, continue longer, and exiſt with much more violence. The ſymptoms peculiarly diſtreſſing in theſe caſes are, exceſſive *tumefaction*, veſications covering very *extenſive ſurfaces*, ſometimes almoſt the whole body, and extreme *pain*, *heat* and *itching*.

The tumefaction is in ſome inſtances confined to the parts firſt affected, in others it is general; the extremities ſometimes ſwell to twice their natural ſize.

"I was acquainted, ſays Kalm, with a perſon, who merely by the noxious exhalation of the Rhus Vernix, was ſwelled to ſuch a degree, that he was as ſtiff as a log of wood, and could only be turned about in ſheets." I know a perſon, whoſe face in the latter ſtage of the diſeaſe, was covered with incruſtations in ſuch a manner, that he reſembled a perſon, having

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by a ſenſation of fulneſs, by heat and itching, and followed by a ſcarlet eruption, extending circularly ſeveral inches around the eyes.

Not only in this, but in ſeveral other cutaneous diſeaſes, the eyes are ſpecifically affected: blindneſs of a ſhort continuance, frequently occurs in violent caſes of the ſmall-pox.

the confluent ſmall pox, in the higheſt degree of violence. And the veſications and ſubſequent ulcerations, are ſometimes ſo extenſive, and their conſequences ſo terrible, that not unfrequently four or five weeks elapſe, before the perſon recovers. In this ſituation as we may eaſily conceive, the patient ſuffers immenſe torture; the whole courſe of the diſeaſe is accompanied by inceſſant burning and itching, and in every poſition in which he can poſſibly be placed, he irritates a part in a ſtate of diſeaſe and high ſenſibility.

One of the moſt ſingular, and at the ſame time, one of the moſt univerſal concomitants of the eruption, when it exiſts in a violent degree, is a *ſympathetic fever* of the arterial ſyſtem. From much enquiry concerning this ſubject, among perſons of every deſcription; from ſeveral caſes which have fallen under my own obſervation; and from a number of facts, which have been communicated to me by ſeveral very intelligent medical friends, I am induced to believe, that this ſympathetic affection of the arterial ſyſtem, occurs in a greater or leſs degree, in *every* caſe, in which the ſymptoms of the diſeaſe are violent.

When we conſider, how frequently local diſeaſes excite the ſympathy of the arterial ſyſtem, it muſt appear ſingular, that this ſhould not have been generally noticed, by authors who deſcribe this eruption, which in ſome inſtances, for a ſhort period, is as violent in its ſymptoms as any other cutaneous diſeaſe whatſoever.

If it be demanded, by what ſymptoms and circumſtances, the exiſtence of this fever is proved? I anſwer: 1. by the quick, frequent, full or tenſe *pulſe*, which in violent caſes univerſally prevails;[*] 2. by blood drawn during the courſe of the diſeaſe, having been found ſizy[†] and cup-formed;[‡] 3. by loſs of appetite and ſickneſs at ſtomach; 4. by a white tongue; 5. by a burning of the palms of the hands and ſoles of the feet; 6. by headach; 7. by a throbbing of the temporal arteries; and 8. by delirium.[§]

Moſt of theſe ſymptoms I have obſerved in ſeveral caſes, that have come under my notice.

The time of the appearance of the fever, after the expoſure to the cauſe of the diſeaſe, is various; in caſes of a leſs degree of violence, it is not excited till the eruption has made conſiderable progreſs, till the ſecond, third or fourth day; in violent caſes it takes place very early in the diſeaſe.

After the detail of all theſe ſymptoms, it might properly be aſked‘ whether or not, in ſome inſtances, death is produced by theſe injurious plants? Several caſes were communicated to me, in which the ſymptoms were ſo violent, that it was more probable that the diſeaſe would terminate in death, than in a recovery; and it is very reaſonable to ſuppoſe, that the extenſive ulcerations might in ſome inſtances terminate in gangrene, or that the ſympathetic fever might proceed ſo far, as to prove deſtructive to the life of the perſon affected. Although I never met with a caſe, in which this diſeaſe proved mortal, yet its poſſibility is rendered very evident by the violence of the ſymptoms in ſome caſes: and that it is capable of producing death, appears likewiſe to be proved by the following quotation from a writer of credit. "In Pennſylvania I was aſſured by a number of reputable perſons, that there were inſtances of perſons having died in conſequence of the bad effects of the Rhus Vernix; and probably by neglecting the uſe of proper remedies." Wangenheim.

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[*] Fontana, in his deſcription of the effects produced by the R. toxicodendron on himſelf, ſeriouſly tells us: I had no fever, but my pulſe was *very quick*.

[†] By Dr. Barton.

[‡] Dr. Cooper.

[§] Several other ſymptoms of fever occurred in a caſe communicated to me by Dr. C. Caldwell. See the Appendix.

There are ſeveral other ſymptoms of this diſeaſe, which on account of their ſingularity deſerve to be deſcribed, though they appear leſs frequently, than moſt of thoſe which have already been enumerated: they might be called with propriety *anomalous* ſymptoms.

1. A *periodical return* of moſt, ſometimes of all the ſymptoms of the diſeaſe, about a year after its firſt appearance, without freſh expoſure to the cauſe in

any manner. This periodical return occurs annually in ſome inſtances, for the courſe of four, five, or even ten years.

A number of caſes of this periodical return have been communicated to me. Several I have obſerved myſelf. But no caſe eſtabliſhes this ſingular occurrence in ſo unequivocal a manner, as the caſe of Dr. Barton. He was poiſoned in the year 1785, near the Ohio; about a year after this, he went to Europe. In the year 1786, nearly at the ſame time of the year when he was firſt affected, moſt of the ſymptoms of the eruption returned: here there could not be the moſt diſtant ſuſpicion of the poiſon being communicated to him by means of the atmoſphere, or in any other manner. The eruption returned annually till the year 1790; at every ſucceſſive attack it was leſs violent in degree.*

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* There exiſts in many reſpects, a ſtriking analogy between the Rhus Vernix and the *Anacardium occidentale.* The juice of the Anacardium, like that of the Rhus Vernix, produces an indelible black ſtain on linen. From its ſtem exſudes a black liquor, which may be uſed for the purpoſes of varniſh. Like the R. Vernix it produces an eruption on the ſkin, which, to complete our analogy, in ſome caſes returns every year periodically. A remarkable inſtance of this was communicated to me by Mr. Joſiah Coates, of Philadelphia, where the eruption returned for four or five years ſucceſſively. The phyſician who had the care of it, employed with ſucceſs in its cure, a *Salivation.* A ſimilar caſe came under the notice of Dr. Phyſick, in which the eruption returned periodically, for ſeveral years. In another caſe of eruption, exci-

To account for this periodical return of the eruption, might furniſh a ſubject for intereſting ſpeculation. But to ſpeculate is at preſent not my intention. The poiſon generally is excited during the hot ſummer months. It is only during theſe months that the eruption re-appears ſpontaneouſly. I have never heard of its recurrence at any other period. During theſe months, from various cauſes, the irritability of the ſkin is conſiderably increaſed; and I believe, on inquiry of perſons thus affected, we ſhould find, that before the re-appearance of the eruption, they have by

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ted by the oil of the caſhew-nuts, in a young woman, who was lately attended by Dr. Phyſick, violent febrile ſymptoms ſupervened, which were relieved by bleeding; the blood drawn was *ſizy*.

The *Hippomane Mancinella*, a celebrated poiſon-tree of tropical countries, is alſo in many reſpects ſimilar to the Rhus Vernix. The milky juice contained in its bark, upon touching the ſkin, immediately raiſes watery veſicles. (Bankrofft's Hiſt. of Guiana.) And a few drops falling from it are ſo cauſtic, as to bliſter the ſkin and produce dangerous ulcers. (Darwin's Bot. Gard.)

Several vegetables which are familiar to moſt perſons, produce effects analogous to the R. radicans and the Vernix; though in an inferior degree. The effluvia of the Nerium *oleander*, produced in a caſe which came under Dr. Barton's notice, an extenſive eryſipelatous affection of the ſkin; the ſame has alſo followed the contact of the flowers of our *Broad-leaſed-Laurel*, (Kalmia latifol:) That an eruption of the ſkin is produced by the common *Rue* of our gardens, is almoſt generally known; and one caſe was communicated to me, in which an univerſal eruption was produced, by the berries of the *Rhus glabrum*.

means of exerciſe, or by other cauſes, produced a certain degree of increaſed action in the veſſels of the ſurface of the body. May not then, with this increaſe of irritability, or of action, in the cutaneous veſſels, a morbid action, ſimilar to that which exiſted about an annual period before, (under analogous circumſtances of every kind) be *aſſociated* ; and by this aſſociation, an inflammation of the ſkin, reſembling the poiſonous eruption, be re-excited? Dr. Ruſh aſcribes, with much ingenuity, the recurrence of the paroxyſms of the intermitting fever, to a certain aſſociation of ideas and motions. This eruption appearing periodically, might be called an annual fever of the cutaneous ſyſtem.

2. In habits which are eaſily acted upon by the poiſon, if proper remedies are not applied early in the diſeaſe, or at leaſt ſoon after the appearance of the veſications, they ſometimes terminate in troubleſome, lingering ulcers, reſembling ſuch ulcers, as are denominated phagedenic. Theſe frequently are the ſource of immenſe pain and diſtreſs to the perſon affected, and if they finally heal, they are remembered by permanent ſcars.

3. The eruption is not unfrequently ſucceeded by a great number of ſmall phlegmons or boils; I have often obſerved this ſymptom. Dr. G. Willſon informed me, that while one of his arms was affected by the common poiſonous eruption, the other was covered with a number of ſmall boils.

4. A ſwelling of the tongue, and an ulceration of the mouth, are in ſome inſtances very painful ſymptoms.

5. A ſwelling of the lymphatic glands. This ſymptom occurred ſeveral times in Dr. Barton's caſe, during the exiſtence of the eruption; he alſo noticed it in the caſe of a perſon, who after being poiſoned by the R. radicans, applied to him for medical aſſiſtance.

6. After the diſappearance of every other ſymptom of the diſeaſe, the patient is ſometimes haraſſed, for many days, by a very diſagreeable *itching*, which extends over the whole ſurface of the body.

In this place I ſhall relate the following two caſes, the ſymptoms of which likewiſe differ from thoſe that uſually occur.

7. I had an opportunity of ſeeing a perſon at the alms-houſe of Philadelphia, in whom the poiſonous eruption had been originally excited, by the ſmoke of the R. radicans. It did not make its appearance till two months after he was expoſed to the ſmoke, when ſmall veſications were ſeen on his ſhoulder, which were eaſily cured by very ſimple remedies. Twelve months after this, the diſeaſe returned upon the ſame part. The ſucceeding year it firſt appeared on his legs; it travelled up his thighs to his arms and ſhoulders, and finally affected his back and face. This was in the month of May, 1797. The diſeaſe now

was in a ſtate of ulceration; the ulcers, however, were ſuperficial, and did not appear to extend beyond the ſkin; they very much reſembled a certain cutaneous affection, which ſometimes occurs in conſequence of the veneral diſeaſe. His eyes were alſo affected at this time, by a ſerous diſcharge, which was followed by a defective viſion, in one of his eyes, and almoſt total loſs of ſight in the other. The blindneſs was relieved, by a ſlight ſalivation and by ſeveral other remedies.

8. A man labouring under an highly inflammatory fever, was bled by a perſon who had handled the Rhus Vernix, but who had uſed the precaution, after detaching the reſinous juice adhering to his hands by ſpirit of wine, to waſh them repeatedly with ſoap and water. About forty-eight hours after the venæſection, a red eruption and ſeveral ſerous veſicles, appeared above the place where the vein had been opened by the lancet; theſe upon examination were found to be the poiſonous eruption. This eruption rapidly extended over the whole arm, and ſome of it appeared on the arm of the oppoſite ſide. The ſcrotum was alſo covered by the eruption and by veſications. The moſt remarkable phenomenon of this caſe was, that during the exacerbation of the fever, the eruption and veſications very ſenſibly increaſed, and the ſcrotum was perceptibly tumefied, while they

almoſt entirely ſubſided during the intervals between the paroxyſms.*

The different methods in which the poiſon is generally communicated, were formerly mentioned; there remains, to enumerate a few ſymptoms, which are produced by ſeveral of the different methods of communication.

1. When the ſmoke of the Rhus Vernix is the exciting cauſe, its effects generally reſemble thoſe produced by other cauſes; but when it has been very powerfully applied, ſymptoms of a different nature have been produced: this appears from the following fact, communicated to the Philoſophical Society of London, by Dr. Sherard. "Some people had cut ſome of the Rhus Vernix for fuel, which they were burning; in a ſhort time they loſt the uſe of their limbs, and became ſtupid; ſo that if a neighbour had not accidentally opened the door, and ſaw them in that condition, it is generally believed, they would ſoon have periſhed."

2. Deſirous of knowing the effects of the *juice* of the R. Vernix on myſelf, I applied a conſiderable

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* This caſe would ſerve to prove, if any proof were required, that the poiſon acts in the firſt place locally on the cutaneous ſyſtem: the patient at the time of its application laboured under a violent affection of the arterial ſyſtem; that two general affections of one ſyſtem (for inſtance the arterial, nervous, &c.) cannot exiſt at the ſame time, is I believe, at preſent almoſt univerſally admitted.

quantity of it to the back of my left hand. This was done while I was ſtanding near a tree, from which the juice flowed after making an inciſion through the bark. A ſlight pungent pain was felt immediately after the application, reſembling that produced by the emplaſtrum cantharidum. The ſpot ſoon aſſumed a black colour, and became ſomewhat elevated; this elevation gradually increaſed; it was accompanied by a conſtant ſenſation of fulneſs and heat. In twenty-four hours, the whole ſpot was covered by a large veſicle, which on being punctured diſcharged a viſcid, ſerous fluid: a ſcar is yet to be ſeen where the juice was applied.

3. It was mentioned, in a preceding part of this diſſertation, that Dr. Barton had excited the eruption by inoculation: a very ſmall quantity of the juice of the Rhus Vernix was introduced by a ſlight puncture, between the cuticle and ſkin of his left hand. In thirty-ſix hours, an itching and tumor were perceived in that ſpot, and ſoon afterwards ſymptoms of the eruption and ſlight veſications appeared on different parts of the body; it produced likewiſe, a ſlight ſwelling of the axillary gland of the left arm, the uſual affection of the ſcrotum, and an univerſal itching. Its progreſs was checked by a remedy, which will be mentioned in its proper place.*

* I have in ſeveral inſtances, and in habits which were very ſuſceptible of the poiſon, attempted to propagate it, by inoculation with the ſerous fluid contained in the veſicles; but in no inſtance was I able to excite the infection.

The following caſe was communicated to me by my very ingenious friend Dr. S. Cooper. "On Monday, about twelve o'clock, I was inoculated on my wriſt, with ſome of the juice of the Poiſon-vine. The next morning when I awoke, my eyelids itched and were redder than natural. In the afternoon this ſymptom became worſe, my face began to itch, ſwell and look red, and my ſcrotum and prepuce were affected in a ſimilar manner. The part where I was inoculated, now began to inflame. During the exiſtence of the preceding ſymptoms, I experienced frequent fluſhings of heat through my whole body; and my pulſe was unuſually quick and frequent. Veſicles were hindered from forming about my eyes and face, by often applying ice to theſe parts. Veſicles aroſe on the ſcrotum, on each wriſt and hand, and on my feet and legs. In about eight days time the whole affection diſappeared. Much cuticle came away from my face."

Concerning the CURE *of the* DISEASE, *produced by the* RHUS RADICANS *and* VERNIX.

From a review of the cauſes and ſymptoms of this diſeaſe, we ſhall eaſily be led to a proper method of *cure.* It is produced by an highly inciting cauſe; in every inſtance an inflammatory affection of the ſkin exiſts, and in many caſes it is attended by an inflammatory fever of the whole ſyſtem. Reaſoning therefore from its cauſes and ſymptoms, I ſhall not heſitate to recommend ſuch remedies, as are generally known, to relieve inflammatory affections. Theſe are chiefly evacuants. But another claſs of remedies, which act locally on the part affected, is neceſſary; theſe remove the exiſting morbid action, by exciting a ſtronger action in the diſeaſed part. The application of theſe remedies to this diſeaſe, and to many others, has been rendered very obvious, by the clear and comprehenſive therapeutical rules, which are taught in this univerſity, by the excellent profeſſor of the Inſtitutes and Clinical medicine.

The remedies are naturally divided into 1. ſuch as act *generally* in the whole ſyſtem, and ſuch as 2. are applied *locally* to the parts affected. Of the former I ſhall recommend Bloodletting, Purging, Cold in the form of ice, cold water or cold air, and Mercury given with the view of exciting a ſalivation.

1. *Bloodletting*. This remedy has lately been uſed, with ſingular ſucceſs, by Dr. Barton and Dr. Cooper of this city, and by Dr. Stocket of Maryland.* The appearance of the blood drawn, was mentioned in a former part of this eſſay. In violent caſes it ſhould never be omitted, and in moderate caſes it will ſhorten the courſe of the diſeaſe, and render the ſymptoms leſs diſtreſſing.

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* It was alſo employed, with good effect, in a caſe communicated to me by Dr. C. Caldwell.

2. *Purging*. This remedy, eſpecially in caſes accompanied by much inflammation, ſhould always be uſed in conjunction with the laſt remedy: It may be particularly uſeful in ſuch caſes, where from the exent of the tumefaction or ulceration, bloodletting is endered impracticable. In theſe caſes this remedy will be one of our chief reſources.

Under this head is to be ranked: copious drinkng of *Sea-water*. This was uſed in a caſe commuicated to me by Mr. Samuel Coates, in which the diſeaſe returned ſeveral years periodically, and reſiſtd all the remedies that were applied, until the paient was ſent to the ſea-ſhore, where it ſoon yielded to ſea-bathing and plentiful potations of *ſea-water*, which produced very copious and continued evacuaons from his bowels. Wherever this is convenient it may be an excellent remedy. The analogy between theſe poiſons and the Mancinella, was mentiond in a former part of this eſſay. It is confirmed by the following circumſtance. Bancrofft (in his Hiſt. f G.) tells us, that in the bad effects produced by the Mancinella, *Sea-water*, and the juice of limes, &c. are effectual remedies. A remedy which is uſed in the cure of the eruption, occaſioned by the Rhus Vernix of Japan and China, produces violent *purgng*.[*]

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[*] Duhalde's Hiſtory of China.

3. *Cold*, whether applied in the form of ice, o
cold water or cold air, is an excellent palliative of al
the ſymptoms, in the early ſtage of this diſeaſe. I
particularly relieves the itching, which in ſome caſe
is very diſtreſſing, and it often retards or entirely pre
vents the tumefaction. A perſon who is very ſuſcep
tible of the poiſon, informed me, that a very col
bath relieved all the ſymptoms and entirely checke
the progreſs of the diſorder. Dr. Cooper derive
great benefit from the application of ice to his face
and in my own caſe every ſymptom was ſoon relie
ed, by the uſe of this excellent remedy. Kalm like
wiſe uſed this remedy with advantage. It was r
marked formerly, that the eruption is leſs eaſily e
cited in cold than in warm weather.

4. In violent caſes, where the ſymptoms of t
diſeaſe runs high, and where the patient's life may b
in danger, I recommend with great confidence, t
internal uſe of *Mercury* with the view of exciting
ſalivation. From its almoſt ſpecific effect in all c
taneous diſeaſes, we may alſo in this inſtance, expe
much from this powerful remedy. I formerly me
tioned a caſe of eryſipelas produced by the Anaca
dium occidentale, in the cure of which it was uſe
with ſucceſs.

2. Topical Remedies.

The firſt and moſt powerful of theſe, is a ſolutio
of *Corroſive ſublimate* in water. This remedy w

rſt employed by Dr. Barton in his own caſe, and by
im it has been recommended to ſeveral other per-
ons: from the ſucceſs which has uniformly attended
is remedy, in every caſe in which it was uſed, he is
d to believe, that it may be employed in the cure of
is eruption, with as much certainty and probability
f ſucceſs, as it is in many other diſeaſes. The ap-
lication of the ſolution, very ſoon excites a ſpecific
flammation of the ſkin in the parts affected, which
this time are in a ſtate of great excitability; this
flammation is of greater force than that produced
the Rhus, which it counteracts or deſtroys.[*] It
on allays the itching, accelerates the ſuppuration of
e veſicles, if any have formed, and brings on a deſ-
uamation of the purulent cruſt, or in moderate caſes,
the cuticle. But, its effects are not topical alone;
all perſons that are eaſily acted upon by mercury,
produces a ſalivation; this happened in Dr. Bar-
n's caſe.[†]

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[*] Dr. J. Otto informed me, that a friend of his had in ſe-
ral inſtances, removed the eruption in a ſhort time, by the ap-
ication of the ſpiritus ſal. ammon. diluted with water: this acts
a manner ſimilar to the ſolution of corroſive ſublimate.

[†] The Ungt. mercur. precip. rubr. is uſed in ſome parts of
nnſylvania in the cure of this eruption; it is called by the in-
bitants of the country, *Poiſon-ſalve.* In the caſe which occur-
d in the alms-houſe of Philadelphia (ſee p. 39) it aſſiſted in the
re of a number of chronic ulcers produced by the R. radicans.
is an excellent remedy in theſe caſes.

2. In moderate caſes I have applied with very conſiderable advantage, an ointment prepared by mixing one dram of ſaccharum ſaturni with one ounce of Unguentum ſimplex. My friend and fellow graduate Mr. P. G. Prioleau informed me, that upon being poiſoned by the R. radicans, particularly o his hands and arms, after uſing ſeveral remedies with little effect, he was cured by the application of a ſolution of ſaccharum ſaturni. It was alſo uſed in conjunction with the Ungt. mercur. precip. rubr. i the caſe related p. 39, with conſiderable advantage.

3. The Unguentum ſimplex of the diſpenſatories ſweet oil, and emollient cataplaſms, ſhould be applied in all caſes, where in conſequence of neglect in th beginning, tedious and ill-conditioned ulcers remai Whenever their cure is much protracted, mercur ſhould be exhibited internally.

With theſe remedies, general and topical, regul ted according to the exiſting ſtage of the diſeaſe, an accommodated to the conſtitution of the patient, an the condition of his ſyſtem, I believe it will never b difficult, to bring the diſeaſe to a fortunate term nation.

I ſhall now enumerate a few of the remedies, whic are moſt generally uſed by the inhabitants of the cou try; among whom, from evident reaſons, this diſea is moſt frequently met with.

The leaves of the Datura Stramonium, Houſele (a ſpecies of Sempervivum) the expreſſed juice o decoction of the roots of the Sanguinaria canadenſis,* cream and water, and a ſolution of common ſalt or of copperas in water. All theſe are applied externally, and may be very proper in moderate caſes : but they are ſuperſeded by the more effectual remedies, above enumerated.

More violent, but leſs commendable are : ſalt diſſolved in hot ſoap-ſuds, brandy, ſpirit or urine. Which have all been uſed externally.

Soot diſſolved in milk is taken by ſome perſons ; perhaps it acts as a cathartic ?

Under this head are to be mentioned ſeveral other remedies, which formerly were very celebrated. Of theſe I can ſay nothing from my own experience.

1. The leaves and wood of both ſpecies of Rhus, burnt to aſhes and rubbed on the parts affected : this has been ſaid to be very effectual in curing the diſeaſe.

2. Kalm, in his travels, obſerves : "Some people aſſured me, that a perſon ſuffering from the noiſome exhalations of theſe plants, would eaſily recover, by ſpreading a mixture of the wood burnt to charcoal, and hogſlard upon the ſwelled parts." †

Wangenheim ſays : "If the poiſon exiſts in its higheſt degree of violence, the aſhes of the wood, prepared in a cloſe veſſel, is uſed in its cure; an ointment is made of it with lard, with which the affected parts are anointed."

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* This is uſed by the country people in all chronic ulcers.

† Dr. Barton has been informed, that an empiric near Lancaſter, uſes an ointment prepared with the charcoal of the R. radicans and hogſlard, with great ſucceſs, in the cure of the itch.

EXPERIMENTS *on the* RHUS GLABRUM.

Experiment 1. About two pounds of the freſh berries of the Rhus glabrum, were infuſed twenty-four hours in a gallon of hot water; the infuſion had an agreeable acid taſte; it was evaporated almoſt to the conſiſtence of a ſyrup, and expoſed in a cool place to cryſtallize. Nearly twelve drams of impure cryſtals of a reddiſh brown colour were obtained: their form was oblong or cuboidal, and by repeated ſolution and evaporation, they were rendered perfectly clear and pellucid. They appeared very analogous to cryſtals of tartar; and the following circumſtances, tend to prove their complete identity with that ſaline ſubſtance.

1. Their taſte very much reſembled the taſte of cream of tartar; it was however more truly acid, devoid of the earthy taſte which always accompanies that ſalt, and which may be owing to the aluminous earth by which it is clarified, or to calcareous earth with which it appears ſometimes to be adulterated. Perhaps the chryſtals obtained from the Rhus, contain a greater proportion of acid. 2. The ſuperabundance of tartareous acid was rendered very evi-

dent by a violent efferveſcence, which took place on adding a ſmall quantity of potaſh to a ſolution of theſe cryſtals. Their analogy to cryſtals of tartar is further proved: 3. By their difficult ſolubility in water; 4. By being rendered much more ſoluble by the addition of a little borax; and 5. By a ſlight red colour, which they produce on blue vegetables.*

The *Gallic acid* has been found to exiſt in every ſpecies of Rhus, which has hitherto been examined by the chemiſt. I have met with it in different proportions, in ſeveral of our native ſpecies of this genus, in the Rhus Vernix, R. radicans, R. typhinum, R. copallinum, and eſpecially in the R. glabrum. And we may very probably ſuppoſe from analogy, that it will be found in a greater or leſs degree, in every ſpecies of this genus.† It appears from the following experiments, that this acid exiſts in different proportions in different parts of the ſame ſpecies: no part of the plant, however, is entirely deſtitute of it; I have found it in the flowers, the leaves, the bark, the ſeeds and even the root. The relative quantity contained in the different ſpecies, is very various: from the few trials I have made, the reſult of which requires much further confirmation, I ſuppoſe they may be ranked in the following order: the Rhus glabrum contains moſt, next the typhinum, copallinum, Vernix and radicans.

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* A ſolution of theſe cryſtals, produced in lime-water and in a ſolution of the acetite of lead, a white precipitation.

† It exiſts plentifully in the Rhus coriaria and cotinus of Europe.

As the Rhus glabrum appeared to contain the gallic acid in the largeſt proportion, and as it was procured with more facility than any of the other ſpecies, I ſubjected it to the following experiments.

Experiment II. The infuſion of the leaves, after a ſhort expoſure to the air, is of a light brown colour; the infuſion of the berries is of a beautiful crimſon colour.

Experiment III. To a pint of pure water, in which one grain of ſulphate of iron had been diſſolved, one drop of an infuſion of one ounce of the leaves in a pint of water, was added; a ſlight greyiſh blue diſcoloration ſoon took place, which in twenty-four hours became more perceptible; if to the ſame ſolution three drops were added, the water ſoon aſſumed a purple colour.

Experiment IV. If to half an ounce of the infuſion of one ounce of the freſh berries in a pint of water, one drop of a ſolution of ſulphate of iron is added, a black precipitation takes place which is immediately re-diſſolved; if even three or four drops are added, ſtill the liquor remains tranſparent: but if now a few drops of a ſolution of potaſh are added, a deep black colour is inſtantly produced.

Experiment V. If to half an ounce of the infuſion of the leaves, of equal ſtrength with that of experiment the third, one drop of a ſolution of ſulphate of iron is added, the liquor immediately aſſumes a black colour: but, if to the ſame quantity, previouſly one drop of diluted ſulphuric acid is added, the black precipitation, as in the laſt experiment, is again re-diſſolved, until the acid is neutralized by the addition of a few drops of a ſolution of potaſh. This experiment was repeated with the ſame reſult, with an infuſion of galls.

Experiment VI. To determine the relative quantity of gallic acid contained in the *leaves* and *berries* of this ſpecies of Rhus, I infuſed one ounce of each, in half a pint of water, and to equal quantities of both infuſions, I added a ſcruple of ſulphate of iron. Characters written with the infuſion of the leaves were nearly black, while ſuch as were written with the infuſion of the berries were only brown. With a view to neutralize the tartareous acid of the berries, I added a few drops of a ſolution of potaſh, an efferveſcence took place, but the blackneſs of the infuſion was not increaſed.*

Experiment VII. To determine the relative quantity of gallic acid contained in the *R. glabrum*, and in *galls*, I infuſed an ounce of the leaves, berries and galls, each ſeparately in a pint of water; to equal quantities of theſe infuſions, I added a ſcruple of ſulphate of iron. Characters written with the infuſion of the berries, were as in the laſt experiment, conſiderably paler than thoſe written with an infuſion of the leaves; while between ſuch, as were written with the infuſion of the leaves and of galls, I could not diſcover the leaſt difference in point of blackneſs; nor could ſeveral of my friends to whom they were ſhewn.

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* Small quantities were firſt added and theſe were gradually increaſed; but though by a very ſmall quantity the colour of the infuſion was not impaired, yet, when it was increaſed, a dirty brown colour was always produced.

Obſerving the blackneſs produced in the laſt experiment by the ſulphate of iron in an infuſion of the leaves, I was induced to believe, that by a due proportion of the relative quantity of the leaves of the R. glabrum and of ſulphate of iron, they might be uſed advantageouſly in the preparation of *ink*; to determine this, the following experiments were inſtituted.

Experiment VIII. My firſt trials were made with the berries; ſix drams of theſe, two of ſulphate of iron, and one of gum arabic, were infuſed in half a pint of water. The ink obtained in this manner, as might readily be expected from the reſult of the ſixth experiment, was of a brown colour. It was not improved by the addition of potaſh. By taking a larger proportion of berries the blackneſs was ſomewhat increaſed.

Experiment IX. I infuſed ſix drams of the leaves, two drams of ſulphate of iron, and one of gum arabic in half a pint of water;* by this infuſion I obtained a very good ink, equal in point of blackneſs, to our common writing ink.

Experiment X. To determine more accurately the degree of blackneſs of this ink, I made a relative trial with exactly the ſame quantity of galls. The blackneſs of characters written with both, after having been kept for four months, was ſo nearly alike, that by the niceſt examination I could ſcarcely perceive any difference: they were ſhewn to, and examined by ſeveral perſons, who were of opinion, that no difference exiſted between them.† If a greater proportion of leaves to the other ingredients was uſed, the intenſity of the blackneſs of the ink was conſiderably increaſed.

The preceding experiments indicate the preſence of a conſiderable quantity of gallic acid; to eſtabliſh more fully the identity of the Rhus glabrum, with thoſe vegetables, which are commonly called *aſtringent vegetables*, I made the experiments which immediately follow.

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* Theſe are the proportions recommended by Mr. Lewis.
Phil. Commerce of Arts.

† When this ink was firſt prepared (with the R. glabrum) and a few days afterwards, it had a ſlightly browniſh hue; this diſappeared in my ſpecimens, after being kept a few weeks; the ink prepared with galls, as is well known, has when recent, a bluiſh caſt.

Experiment XI. To a very ſtrong, filtered infuſion of the leaves, a ſmall quantity of a ſolution of potaſh was added; a very copious yellowiſh precipitation ſoon took place; the addition of potaſh was continued till no more precipitation enſued: after ſome time the ſupernatant liquor was poured off, and a few drams of ſulphuric acid were added to the precipitation, by which it was inſtantaneouſly diſſolved.*

Experiment XII. If to an infuſion of the berries, the ſolution of potaſh was added, a violent efferveſcence took place, which was owing to the tartareous acid of the berries; (Exper. 1.) by increaſing the quantity of potaſh, a precipitation enſued, as in the laſt experiment, which was very ſoluble in ſulphuric acid.

Experiment XIII. After ſaturating about two pints of the infuſion of the berries with potaſh; half an ounce of diluted ſulphuric acid was added to it: the liquor then was ſuffered to evaporate ſpontaneouſly. In about two months a number of cryſtals were formed, reſembling thoſe of ſulphate of potaſh.

Experiment XIV. To the clear ſupernatant liquor, remaining in the twelfth experiment, ſmall quantities of ſulphuric acid were added; a precipitation took place, which being dried, by forming a dark brown tincture with alcohol, exhibited evident ſigns of the preſence of a reſin, which however exiſts only in ſmall quantity.

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* The precipitation was inſoluble in water and in alcohol.

Experiment XV. In the ſupernatant liquor of the twelfth experiment, a ſolution of ſulphate of iron produced a black precipitation; the oxygenated muriate of mercury, and the muriate of barytes, produced a precipitation of a brown colour.

Experiment XVI. The precipitation produced by potaſh in the infuſion of the leaves, is readily ſoluble in the ſulphuric acid; (as appears from the XIth Experiment) but, by the addition of potaſh, ammoniac, or a ſolution of borax, it is again precipitated. By ſpontaneous evaporation of this ſolution, an highly aſtringent, gummy ſubſtance is obtained, which being diſſolved in water, is readily decompoſed by potaſh or by muriate of barytes.

Experiment XVII. The infuſion of the berries concentrated by evaporation, produced in a ſolution of ſilver in the nitrous acid, a white, and in a ſolution of mercury, a yellow precipitation; in a ſolution of the acetite of lead it produced a white precipitate; in lime-water and the oxygenated muriate of mercury a grey precipitate; and in a ſolution of ſulphate of potaſh a brown precipitate.

Experiment XVIII. About two pounds of the berries, recently collected, were digeſted ſeveral days in a gallon of water; the liquor was then filtered, evaporated to a pint and one ounce of quick-lime gradually added to it; having digeſted twenty-four hours, the calcareous ſediment was collected, and frequently waſhed with warm water; one ounce of diluted ſulphuric acid was now poured upon it, and after ſome time the liquor was poured off, evaporated to a pellicle, and expoſed to cryſtallize. About two drams of long, ſlender, four-ſided cryſtals were obtained.* Theſe cryſtals did not effloreſce in the air; diſſolved in water they produced a copious milky precipitation in lime-water and in a ſolution of the acetite of lead.

Experiment XIX. On half an ounce of the berries of the R. Glabrum, I poured five ounces of ſtrong nitrous acid; a large quantity of nitrous gaz was diſengaged; a moderate degree of heat was applied for ſeveral hours; the remaining fluid was then poured into a plate, and in a ſhort time a large number of delicate, needleform cryſtals were produced. A ſolution of theſe cryſtals, cauſed an inſtantaneous milky precipitation in lime water and in a ſolution of the acetite of lead; in a ſolution of ſulphate of zinc or copper, a white precipitate was produced. Theſe cryſtals effloreſced when they were expoſed to an air of a moderate temperature.

On a repetition of this experiment, I obtained ſome cryſtals of the ſame form with thoſe juſt deſcribed, and others, of a quadrilateral form, terminated by dihedral ſummits; the former of which effloreſced in the air.

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* I obtained at the ſame time, a few very minute cryſtals of the ſulphate of potaſh.

Experiment XX. By treating half an ounce of the extract of R. Glabrum, with five ounces of nitrous acid, I obtained lamellated and oblong cryſtals, which poſſeſſed all the properties of thoſe deſcribed in the laſt experiment.

When theſe cryſtals are thrown into water, an evident crackling noiſe is heard; this is peculiar to this ſalt, and is aſcribed by Fourcroy to a ſudden breaking of its particles.

Experiment XXI. About three pounds of the leaves of the Rhus radicans were infuſed in brandy; after being boiled a few minutes, they were expoſed in a moderate temperature. At the end of ſeveral months, this infuſion was found converted into very ſtrong vinegar; it reſembled that which is obtained from cyder, exceeding it however in ſtrength. Its taſte was very pungent, and it retained ſome of the peculiar odour of the plant. On adding a little potaſh to it, a violent efferveſcence took place.

Experiment XXII. To two pints of a ſtrong infuſion of the berries of the Rhus glabrum, ſome chalk, and a ſmall quantity of weak ſpirit of wine was added; the mixture was then expoſed in a veſſel ſlightly ſtopped, in a moderate temperature. In the courſe of three or four months, vinegar was produced, which reſembled that generally uſed for culinary purpoſes; ſome of it being added to a little potaſh, produced conſiderable efferveſcence.

Observations *on the preceding* Experiments.

By the firſt experiment a conſiderable quantity of ſemiſaturated tartarite of potaſh was obtained. In order to ſucceed with this experiment, it is neceſſary to collect the berries while they are in a ſtate of entire perfection, and covered with the white ſaline ſubſtance, which was deſcribed in the hiſtory of the growth of the plant; if this is not attended to, the ſalt is diſſolved by the rain or moiſture, to which the plant is frequently expoſed. I have endeavoured to eſtabliſh the identity of this ſalt with cryſtals of tartar, by a few ſimple but apparently concluſive experiments and analogies. Mr. Hermbſtædt obtained a ſimilar ſalt from the berries of the Rhus coriaria,* which has been analyſed by Mr. Tromſdorf:† I regret that I had not an opportunity of ſeeing this analyſis. This ſalt, Mr. William Bartram informed me, exiſts in much larger quantity, on the berries of the Rhus copallinum; it is uſed in the preparation of punch, and in his opinion, is nearly equal to the juice of lemons, for that purpoſe.

To determine, with the utmoſt degree of preciſion, the relative quantity of gallic acid, contained in different parts of the R. glabrum and in galls, was the object of the third, the ſixth, and ſeventh experiments; the reſult is obvious, and will be applied more particularly under the ſubject of ink.

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* Phyſikaliſch-chemiſche Beobachtungen, pag. 210.

† Crell's annals. 1787.

In the fourth experiment, we obſerve the black precipitation produced by ſulphate of iron in a ſolution of the berries, to be immediately re-diſſolved; from a review of the firſt experiment, this circumſtance admits of very eaſy explanation; the tartareous acid, which exiſts in the berries in large proportion, re-diſſolves the iron and holds it in ſolution, by which means the effect of the gallic acid is directly counteracted. This is rendered ſtill more evident, by the immediate black precipitation which enſues, when the tartareous acid is neutralized by potaſh.

In the fifth experiment, the action of the tartareous acid is imitated by the addition of a little ſulphuric acid; the reſult of this confirms the obſervations that were made on the laſt experiment.

From the reſult of theſe experiments, we can draw an important practical inference, with regard to the uſe of the R. glabrum in the art of dying. It is very common in many parts of this country, to employ the berries in preparing a black dye for hats and for other ſubſtances; from a compariſon of the fourth and fifth, with the ſixth and ſeventh experiments, it appears, that they are much leſs adapted to this purpoſe than the leaves, which I ſhall recommend hereafter. Although the tartareous acid be neutralized by potaſh, yet, as it is impoſſible to regulate the proportion of potaſh ſo exactly, as not to ſaturate at leaſt a part of the gallic acid alſo, the colour in this caſe is by no means ſo black, as that produced by the leaves; but it is generally of a ruſty brown hue.

In the eighth, ninth and tenth experiments, my object was to determine the probable utility of the Rhus glabrum in the preparation of *ink*. In the eighth, the berries alone were uſed; the ink produced by theſe (according to the fourth and ſixth experiments) was of a brown colour. The reſult of the ninth and tenth experiments, not only fully anſwered, but even in ſome degree, exceeded my expectations. The quality of the ink which they afforded, and the relation they bear to that prepared with nut-galls, has been mentioned in that account of thoſe experiments. The qualities, and the principles of the formation of ink, have always been conſidered as a matter of importance. Chemiſts of the firſt reputation, have at different times been engaged in the inveſtigation of this ſubject. Among the number of thoſe who have cultivated it with moſt ſucceſs, are Mr. Lewis and Dr. Woodhouſe. The experiments of Mr. Lewis were conducted with great accuracy and ingenuity; his obſervations on this, and on ſeveral other ſubjects, relative to chemiſtry and natural philoſophy, deſerve the attention of every man of ſcience: he may be ſaid to have carried the *practical* part of the ſubject of ink, to a very high degree of perfection: but the *theory* was more ſatisfactorily eſtabliſhed, by the clear and deciſive experiments of Dr. Woodhouſe.* It is not my intention to detail the facts and experiments, on which this ingenious theory is founded. My object is, to recommend the uſe of the leaves of the R. glabrum, as a ſubſtitute for nut-galls, in the preparation of ink. From the promiſing reſult of ſeveral of the preceding experiments, I am led to do this with confidence. Galls are procured with conſiderable expenſe, while the R. glabrum grows in abundance in almoſt every part of the United States; and in addition to the facility with which it is procured, it may always be had in a ſtate of perfection, and not, as is frequently the caſe with galls, injured by age or decay.*

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* In Nicholſon's Chemical Dictionary, we find an extract from a ſeries of experiments, on the ſubject of ink, by a French gentleman of the name of Ribaucourt. Although his experiments are numerous and ingenious, they don't diſcover that ſimplicity and pertinence, which characterizes the experiments to which I above alluded. He conſiders the precipitate, produced by alcali in an infuſion of galls, as a calcareous earth; and finally infers from his experiments, that in the formation of ink, the calcareous earth of the galls unites with the vitriolic acid of the vitriol, and forms ſelenite, moſt of which falls down with the firſt precipitate, on account of its inſolubility in water; while the calx of iron combines with the colouring matter of the galls, and forms the black fecula which ſubſides more ſlowly.

But not only in the preparation of ink, do I wiſh to recommend the uſe of the R. glabrum; the ſixth and ſeventh experiments, in addition to thoſe which have juſt been mentioned, point out its utility for ſeveral other purpoſes. In the art of *dying black*, immenſe quantities of galls are now conſumed, which are purchaſed at a very high rate. A few trials, I believe, would convince our artiſts, that the leaves of the R. glabrum, might entirely ſupply the place of galls.†

For the purpoſes of *tanning*, ſeveral ſpecies of Rhus, which are very analogous to our ſpecies, are cultivated in many parts of Europe: the R. coriaria in Turkey, Germany, Spain and France, the R. cotinus in Italy.‡ Our own foreſts are ſenſibly conumed; our oak-trees will ſoon be exhauſted. To hat vegetable then, for a ſubſtitute, can we ſo readily reſort, as to the R. glabrum? It grows plentifully in moſt parts of the United States, and where it s deficient, it may eaſily be cultivated; its growth s rapid, and while in a very young ſtate,* it anſwers ll the purpoſes of this art.

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* The ink produced by the R. glabrum reſembles that made with galls, not only in its degree of blackneſs; but, the precipitate of the iron, likewiſe remains eaſily ſuſpended in the menſtruum, by the addition of gum arabic, and does not, like that prepared with adſtringent vegetables containing much reſin, concrete into large particles.

† If it ſhould be found in trials in the large way, that the quantity of gallic acid contained in the R. glabrum, is not quite equal to that of galls, this defect may very eaſily be remedied, by employing it in greater proportion.

‡ Smith's Tour.

I have thus endeavoured to point out the probable tility of the R. glabrum in ſeveral of the moſt uſeful f our arts. The further inveſtigation of this ſubject, ſpecially on a larger ſcale, is requiſite. I wiſh it to e conſidered, not merely as a matter of philoſophical curioſity. It deſerves attention not only in a local or ndividual point of view, but its application may become of a more extenſive nature. I have no doubt, hat at a future period, the cultivation or preſervation f this plant, will be conſidered an object of general, f national policy.

The analyſis of adſtringent vegetables has of late been effected with great accuracy: in the eleventh and ſeveral of the ſucceeding experiments, (12, 14, 5 and 16) it was my deſign to ſhew the ſimilarity of the R. glabrum to ſeveral of the moſt powerful of this claſs. The reader will perceive, that moſt of them were ſuggeſted by the experiments of Dr. Woodhouſe;* whoſe accurate analyſis of the Perſimon has added much to our knowledge of the ſubject of vegetable adſtringency.

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* The ſhoots of the R. coriaria, are cut down every year, quite to the root; and after being dried, they are reduced to powder by a mill, and thus prepared for the purpoſes of tanning.
Nichol. Chem. Dict.

In the eleventh experiment, the alumine, one of the conſtituent parts of adſtringent vegetables, was precipitated from a ſtrong infuſion of the leaves, by a ſolution of potaſh: one of the chief characteriſtics of this precipitate, is its ready ſolubility in ſulphuric acid. The reſult of the twelfth experiment concurred with that of the laſt, after the tartareous acid of the berries was ſaturated. The quantity of reſin contained in the R. glabrum, appears to be very minute. Exp. 14. In the ſixteenth experiment, by the re-union of the alumine, precipitated from an infuſion of the leaves, and ſulphuric acid, a liquor was produced which poſſeſſed all the properties of a ſolution of the common ſulphate of alumine. In reviewing theſe and the preceding experiments, we find in the R. glabrum all the component parts of adſtringent vegetables: a ſmall proportion of *reſin*, and a conſiderable quantity of *gallic acid* and of *alumine*.

In the thirteenth experiment, the ſulphuric acid, in conſequence of its greater affinity, appeared to unite with the potaſh of the mixture, while the tartareous acid was ſeparated. The precipitations produced in the ſeventeenth experiment, reſemble thoſe that are produced in the ſame ſolutions, by the cryſtallized acid obtained from the nut-gall.

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* Inaugural Diſſertation, 1792.

The deſign of the eighteenth and ſeveral of the ſucceeding experiments, was different from thoſe we ave already diſcuſſed. In the eighteenth, by the proceſs invented by Scheele for obtaining the pure artareous acid from cryſtals of tartar, I obtained an cid, which appeared to poſſeſs all the properties of he tartareous acid. I found it of importance to employ quick-lime in this proceſs; with common chalk he experiment did not ſucceed. This experiment ffords additional proof, to what was ſaid in conſidering the firſt experiment, of the nature of the ſalt ob ained by lixiviation from the berries.

By ſubjecting the berries and extract of the R. glabrum to the action of the nitrous acid, according to he proceſs generally employed for procuring the ox-lic acid, I obtained cryſtals of different kinds: ſome pon examination appeared to poſſeſs the properties nd form of the oxalic, while others more exactly reſembled the tartareous acid. The affinities of theſe wo acids to earthy and to other ſubſtances are ſo nearly alike, that I have found it ſomewhat difficult to diſtinguiſh between them. One of the moſt evident marks of diſtinction appeared to be the circum-tance, that the oxalic acid generally effloreſced in a warm temperature, while the tartareous did not. It is not difficult to conceive, that by the ſame proceſs theſe two acids ſhould be procured. Hermbſtæd obtained from ſugar by weak nitrous acid, tartareou by ſtrong, oxalic acid. The oxalic differs from th tartareous, merely in being more highly oxygenated it is in fact the moſt oxygenated of all vegetable acid This is one inſtance among innumerable others, o the ready convertibility of one vegetable acid int another; the analogy between many of theſe acids i ſo great, that they are conſidered by ſeveral chemiſt as fundamentally the ſame. Among the moſt reſpectable characters who entertain this opinion, ar Weſtrumb* and Hermbſtædt,† two German chemiſts the former contends that the acetous is the only elementary vegetable acid, while the latter conſiders a ſuch excluſively the tartareous. On reviewing thei labours, every perſon will admire their perſeveranc and ingenuity: but neither of them has yet been abl ſo far to extend or generalize his experiments, as t eſtabliſh his hypotheſis.

In the twenty firſt experiment, by the infuſion o the leaves of the R. radicans in brandy, after expoſure for ſeveral months, an excellent vinegar wa produced. Different ſpecies of Rhus have long bee employed in the preparation of vinegar. I have bee informed by the gardener of the Pennſylvania Hoſpital, who has ſeveral years reſided in Canada, tha the French inhabitants of that country about Montreal, prepare a very good vinegar from the berries of the R. glabrum. The berries are boiled in water, and afterwards expoſed in a caſk to the heat of the ſun, in order to ferment. "The young germen of the fruit of the R. typhinum, when fermented, produces vinegar; hence it is called *vinegar tree.*" Encyclop. Both theſe ſpecies grow abundantly in many parts of Pennſylvania, where they might be collected, fermented, and afford cheap and excellent vinegar.

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* Keir's Chemical Dictionary.

† Phyſikaliſch-chemiſche Beobachtungen.

By the twenty-ſecond experiment, vinegar was likewiſe produced; in this inſtance, was not the tartareous acid of the berries gradually converted into the acetous?

Concerning the USE *of ſeveral ſpecies of* RHUS, *in the art of* DYING.

Experiment I. The freſh leaves of the *Rhus radicans,* broken off from the plant, exſude a liquor of a white milky appearance; this liquor applied to flannel, to muſlin or linen, imparts to them, after being a ſhort time expoſed to the light, and eſpecially to ſunſhine, an intenſely black colour. Applied to paper it ſtains it black in the ſame manner. The liquor when firſt applied, is ſcarcely viſible, it reſembles a ſpot of oil, but gradually becomes yellow, red, brown, and finally black. This black ſtain cannot be waſhed out by means of alcali or ſoap. It does not fade on expoſure to the air. Alcohol appears to have no action upon it. If leaves or branches are broken off and expoſed to the air, the juice exſuding from their ends, likewiſe becomes black; in this caſe the colour has a more gloſſy appearance.

Experiment II. In order to obtain this elegant black juice, for the purpoſe of fixing it on flannel or linen, I pounded ſome of the ſtalks which appeared to abound with it, and expreſſed their juice; but I obtained merely a greeniſh liquor, the black colouring matter appeared to be abſorbed by the pith of the ſtalks. I have tried a variety of methods, to extract or ſeparate this black colouring matter, which exſudes from every part of the plant, but with none have I, as yet, been able to ſucceed.

Experiment III. In a ſtrong filtered decoction of the freſh leaves of the Rhus radicans, I boiled for the ſpace of an hour, a ſmall piece of flannel, muſlin, linen and ſilk. It imparted to flannel and ſilk a dark fawn colour, which after the ſtuffs were once waſhed in ſoap and water, was permanently fixed. Linen and muſlin had ſcarcely taken up any of the colouring matter.

Experiment IV. In a decoction prepared in the ſame manner, (as in the laſt experiment) I boiled ſmall pieces of flannel, muſlin and linen, after having previouſly ſteeped them in a ſtrong ſolution of ſulphate of alumine. The flannel was died of a dark yellow colour, which was permanently fixed. With linen and muſlin the ſucceſs was not better than in the laſt experiment.

Experiment V. In a decoction, ſimilar to that uſed in the third experiment, after adding a little vinegar, I boiled ſmall pieces of flannel, muſlin and linen; they acquired a dirty brown colour: with ſmall quantities of the nitrous or ſulphuric acid, the reſult was nearly the ſame.

Experiment VI. To ſeparate portions of the decoction of the third experiment, I added ſmall quantities of nitrate of potaſh, muriate of ſoda, potaſh and urine: the ſtuffs were impregnated with a brown or greyiſh colour; but neither of theſe promiſes the leaſt utility in dying.

Experiment VII. In a decoction of the leaves of the R. radicans, prepared with the addition of one fourth part of ſpirit of wine, I boiled a piece of flannel which had been ſoaked in a ſolution of alum; it acquired an elegant pale yellow colour.

Experiment VIII. In the ſimple decoction of the leaves and bark of the *Rhus Vernix*, a piece of flannel acquired a pale fawn colour; and

Experiment IX. A piece of flannel, having been ſteeped in the ſolution of alum, acquired a very brilliant yellow colour.

Experiment X. With the freſh bark of the *Rhus glabrum*, a ſtrong decoction was prepared, in which out by means of alcali or ſoap. It does not fade o expoſure to the air. Alcohol appears to have no ac tion upon it. If leaves or branches are broken o and expoſed to the air, the juice exſuding from the ends, likewiſe becomes black; in this caſe the colo has a more gloſſy appearance.

Experiment II. In order to obtain this elega black juice, for the purpoſe of fixing it on flannel linen, I pounded ſome of the ſtalks which appear to abound with it, and expreſſed their juice; but obtained merely a greeniſh liquor, the black colou ing matter appeared to be abſorbed by the pith the ſtalks. I have tried a variety of methods, to e tract or ſeparate this black colouring matter, whi exſudes from every part of the plant, but with no have I, as yet, been able to ſucceed.

Experiment III. In a ſtrong filtered decoction the freſh leaves of the Rhus radicans, I boiled for t ſpace of an hour, a ſmall piece of flannel, muſli linen and ſilk. It imparted to flannel and ſilk a da fawn colour, which after the ſtuffs were once waſh in ſoap and water, was permanently fixed. Lin and muſlin had ſcarcely taken up any of the colou ing matter.

Experiment IV. In a decoction prepared in ſame manner, (as in the laſt experiment) I boil ſmall pieces of flannel, muſlin and linen, after havi previouſly ſteeped them in a ſtrong ſolution of ſ phate of alumine. The flannel was died of a dark yellow colour, which was permanently fixed. With linen and muſlin the ſucceſs was not better than in the laſt experiment.

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Experiment X. With the freſh bark of the *Rhus glabrum*, a ſtrong decoction was prepared, in which ſmall pieces of ſilk and flannel were dyed of a yellowiſh fawn colour; which on ſilk appeared more elegant, than that of any of the former ſimple decoctions.

Experiment XI. In the ſame decoction, a piece of flannel and ſilk, after being impregnated with a ſolution of alum, acquired a very handſome permanent yellow colour.

Experiment XII. In a decoction of the *leaves* and ſtalks of the R. glabrum, a piece of flannel and ſilk having been ſteeped in a ſolution of alum, acquired a yellow colour, reſembling that of the laſt experiment.

Experiment XIII. In a ſtrong decoction of the R. radicans, in which a certain quantity of ſulphate of iron was diſſolved, I boiled repeatedly a piece of blue woollen cloth; it acquired a deep black colour.

REMARKS *on the preceding* EXPERIMENTS.

The *black juice* which flows from ſeveral ſpecies of Rhus, on wounding their ſtem or detaching their leaves (experiment 1.) has long attracted the notice of naturaliſts. *Kæmpfer* appears to have been the firſt, who deſcribed the juice diſtilling from inciſions into the R. Vernix.* *Lawſon*, in his natural hiſtory of Carolina, publiſhed in the year 1709, has the follow-

* Amœnitates exoticæ.

g paſſage : "The juice of the Poiſon-vine will ſtain
ien, never to waſh out. It marks a blackiſh blue
lour, which is done only by breaking a bit of the
ie off, and writing what you pleaſe therewith."*
1755 the *Abbé Mazeas* communicated to the Phi-
ophical Society of London ſeveral experiments,
ich he made on ſuggeſtion of the Abbé Sauvages,
th three different ſpecies of Rhus : †. He men-
ons having produced a brown ſtain on linen with the
ice of the R. Vernix, while with the juice of another
ecies, which he calls Hedera trifolia Canadenſis,
produced a deep and permanent black. The lat-
of theſe plants, from his deſcription, evidently ap-
ars to be the R. radicans.‡ This ſuppoſed diſco-
ry of the A. Mazeas, was the cauſe of the contro-
rſy between Mr. P. Miller and Mr. I. Ellis, which
s mentioned in the deſcription of the R. Vernix.

Since the time of the Abbé Mazeas, this ſubject
s been attended to by ſeveral perſons, and among
hers, by the ingenious Mr. Lewis : hitherto their
ours have not been ſucceſsful in extracting or ſe-
rating the black juice, for the purpoſe of fixing it
linen. The ſubject deſerves to be further inveſti-
ted.

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* He adds : "I have thought, that the Eaſt-India natives ſet
ir colours, by ſome ſuch means, into their fineſt callicoes."

† London Philoſophical Tranſactions, v. 49.

‡ The ſtain produced by the R. Vernix, I have always ob-
ved, to be leſs black than that produced with the R. radicans.

It is ſuppoſed by ſome perſons, that the Indians of North-America make uſe of the R. radicans, in ſtaining different ſubſtances of a permanent black colour.

The circumſtance, of the immediate change of the colour of the juice from white to black, upon expoſure to atmoſpheric air, is very ſingular. What would be the effect of an atmoſphere of pure azote? or oxigene?

By the ſimple decoction of the Rhus radicans, vernix and glabrum, a fawn colour of a darker or paler hue, is produced on flannel and ſilk; which appears to beſt advantage on the latter. By none of my experiments, I was able to impart to linen or muſlin, the ſame colour that was eaſily imparted to flannel and ſilk: it appears neceſſary that they ſhould previouſly undergo ſome proceſs, to fit them for the reception of the colouring matter.

If the flannel or ſilk, was ſteeped in a ſolution of alum, before being boiled in the decoction of the different ſpecies, it acquired a very good yellow colour.

Every one of theſe colours was permanently fixed.*

It appears to me, from a review of my ſpecimens, that ſeveral ſpecies of Rhus, and eſpecially the glabrum, might be employed with conſiderable advantage, in imparting a yellow colour to flannels.

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* The reſult of theſe experiments agrees with thoſe of Berthollet on the Rhus coriaria, "The R. coriar. alone, he ſays, gives a fawn colour inclining to green; but ſtuffs that have been impregnated with acetous alum, take a very good and durable yellow."

Its cheapneſs, and the facility with which it is procured, ought certainly to recommend it to our dyers.

To the decoction of the ſeventh experiment, a ſmall portion of acohol was added; this appeared to increaſe the brilliancy of the colour: it is probable that the colouring matter of theſe plants is contained chiefly in their reſinous part, which is rendered soluble by the extractive matter they poſſeſs in conſiderable proportion.*

CHEMICAL ANALYSIS *of the* RHUS VERNIX *and* RHUS RADICANS.

Experiment I. I diſtilled about two pounds of the flowers and leaves of the Rhus vernix, after adding to them a few quarts of water, in a ſmall copper ſtill; a moderate degree of heat was applied; the fluid which came over, was ſlightly impregnated with the odour of the plant, but did not appear to poſſeſs any active properties. From the liquor remaining after diſtillation, I obtained by evaporation one ounce of extract, of a dark brown colour.

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* A young man, a native of the United States, is ſaid to have prepared a kind of ink, reſembling China ink, from the Rhus radicans; for the excluſive privilege of making which, he procured (about 30 years ago) a patent from the Britiſh parliament. It appears probable to me, that it was prepared with the charcoal of the bark of the Rhus radicans, finely levigated and conglutinated by means of gum or glue.

Experiment II. About two pounds of the leaves and flowers of the Rhus radicans, were diſtilled, like thoſe of the vernix in the laſt experiment, and with a ſimilar reſult. I obtained no eſſential oil, either by this or by the laſt experiment; although the odour of the flowers of both ſpecies was highly aromatic, and appeared to indicate its preſence. It is probable, that by employing very large quantities of the flowers, a ſmall portion of eſſential oil might be obtained. I had not an opportunity of determining with accuracy, the properties of the diſtilled water; I have no doubt, but that in perſons who are eaſily affected by the poiſon of theſe plants, it would produce a cutaneous eruption. *Du Freſnoy** obſerves, " the leaves inflamed and ſwelled the hands and arms of thoſe that took them out of the ſtill, and brought on an itching, which remained for ſeveral days." No effect was produced on my hands by handling the leaves, remaining after diſtillation; the cauſe of which was mentioned in a former part of this eſſay.

The liquor remaining after diſtillation, and a ſolution of the extracts, of both ſpecies, produced a copious black precipitation in a ſolution of ſulphate of iron.* Might not an extract of the Rhus glabrum, be advantageouſly employed for the purpoſe of dying black? It would contain the gallic acid in a very concentrated ſtate, a ſmall quantity only would be requiſite, and it might be very conveniently preſerved for uſe.

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* Des propriétés de la plante appellée Rhus-radicans, pag. 46

Experiment III. Several ounces of the berries of the Rhus vernix, radicans and glabrum, were ſeparately expoſed in a retort, to an intenſe degree of heat. A pellucid fluid, of an empyreumatic ſmell, firſt paſſed into the receiver; the degree of heat being increaſed, a black empyreumatic oil was obtained, reſembling that which by this proceſs is procured from moſt vegetables. The reſult was the ſame with the three different ſpecies. In the pellucid fluid which firſt came over, a ſlight precipitation was produced by potaſh, ſulphuric acid and oxygenated muriate of mercury. This diſtillation, with a violent degree of heat, is at preſent generally omitted in the analyſis of vegetables; from plants which poſſeſs the moſt oppoſite properties, from " cabbage and hemlock", the ſame products are obtained. I was convinced of its fallacy, by the reſult of theſe experiments: the preſence of the gallic acid, one of the chief component parts of theſe vegetables, was ſcarcely diſcoverable in the products of this diſtillation.

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* The quantity of extract which I obtained after the diſtillation of the Rhus radicans, amounted to ſix drams.

Experiment IV. From one ounce of the dried bark of the Rhus radicans, I obtained, by frequent infuſions with rain water, thirty-five grains of pure extract.

Experiment V. One ounce of the powdered bark of the Rhus radicans, was repeatedly infuſed in highly rectified alcohol; by ſpontaneous evaporation, after carefully filtering this infuſion, I obtained fifty-five grains of an elegant ſhining, deep-brown reſin.

Experiment VI. Four drams of the powdered bark of the Rhus vernix, afforded two ſcruples of reſin, reſembling that obtained from the R. radicans. A ſolution of the reſin of both ſpecies in alcohol, produced in a ſolution of the ſulphate of iron, a copious black precipitation. This reſin very much reſembles the juice exſuding from the bark of theſe plants. It is probable, that it might be collected in this manner, for the purpoſes of varniſh.

Experiment VII. By infuſing the bark of both ſpecies, in common ſpirit, a conſiderable quantity of a gum-reſinous ſubſtance, of a brown gloſſy appearance, was obtained.

Experiment VIII. A quantity of the leaves of the Rhus radicans and glabrum, being infuſed in boiling water, and expoſed to a warm temperature, (in the month of July) ſoon paſſed into a ſtate of fermentation, and emitted a ſmell reſembling that of ſmall-beer. Whether upon diſtillation ſpirit of wine might be obtained from them, I have not yet determined.

Of the MEDICAL PROPERTIES *of the* RHUS RADICANS.

Little is at preſent known, concerning the *internal* effects of the Rhus radicans on the human body, or concerning its qualities as an article of the materia medica. To determine its probable utility or ineſficacy in the cure of diſeaſes, was one of the objects, which at the commencement of the examination of the properties of this vegetable, I had particularly in view. A defect of proper caſes for its exhibition, and the interference of a variety of other purſuits, have prevented me from collecting the neceſſary materials for this purpoſe. A conciſe ſtatement of what has been written on this ſubject by others, and a few facts and obſervations, which I have had an opportunity of collecting, will be related in this ſection: in how far future experiments will confirm or refute theſe obſervations, I am not able even to conjecture.

To a man, who had laboured under pulmonary conſumption nearly two years, and who was in a very debilitated ſtate, I gave two ounces of a ſtrong infuſion of the leaves of the Rhus radicans; it excited ſome fever, increaſed the frequency and hardneſs of his pulſe, produced pain in his bowels, and an increaſed flow of urine; after the diſappearance of theſe ſymptoms, his pulmonary complaint was conſiderably relieved. His wife, invited by the agreeable odour of the infuſion, drank a tea-cup full; it produced

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an unuſual degree of cheerfulneſs, and a copious diſcharge of urine.

A perſon who had been afflicted above a year, with a very obſtinate headach, took four ounces of a ſtrong infuſion of the leaves of the R. radicans. In conſequence of this, he diſcharged, by his own account, in one night nearly as much urine, as he was accuſtomed to do in a week. He had been in the habit of diſcharging very ſmall quantities.

In the caſe of a woman, who had univerſal anaſarca, the infuſion produced a copious perſpiration, by which ſhe was conſiderably relieved.

In two caſes of pulmonary conſumption, in which the infuſion of the leaves, and ſmall quantities of the extract were exhibited, they appeared to produce an increaſe of the ſymptoms of the diſeaſe, and were ſoon omitted. The ſubject of the firſt of theſe caſes was a man in the early ſtage of the diſeaſe; the other, a woman about twenty-five years of age, originally of a plethoric habit: the extract produced a pain in her ſtomach. In another caſe of the ſame diſeaſe, ſmall quantities of the extract evidently relieved the ſymptoms; the perſon was aged; the medicine, in her opinion, relieved her by keeping the bowels open.

From the foregoing caſes, it appears, that the Rhus radicans acts ſlightly as an incitant and diuretic.

It is a very general opinion, among the inhabitants of the weſtern parts of Pennſylvania, eſpecially about

Carliſle, that the Rhus radicans is an effectual remedy in the cure of phthiſis pulmonalis. Dr. Woodhouſe in his inquiries concerning this ſubject, met with a young man, who lived in the vicinity of that place, and who had been relieved of a pulmonic affection, by an extract prepared from the bark of this vegetable. The young man informed him, that it relieved the pain in the breaſt, produced an eruption on the ſkin, and a ſlight ſalivation; and that it opened the bowels. He remarked likewiſe, that in order to derive benefit from it, it is neceſſary to take large quantities. Schœpf, in his mat. med. Americana, has the following obſervation: "Radices (R. radicant.) a nonnullis in Aſthmate chronico bono cum ſucceſſu adhibebantur in Lancaſter."

If it ſhould be found, by further trials, that the Rhus radicans internally exhibited, is not an active medicine; the effects which it produces on the external ſurface of the body, may ſtill render it highly valuable, in the cure of many diſeaſes. Its application for evident reaſons, will be confined to particular habits and conſtitutions. A determination to the ſkin produces relief in many acute diſeaſes; and the production of violent cutaneous affections, has cured or relieved many diſeaſes of a chronic nature. Eruptive diſeaſes have in ſeveral inſtances removed mania. Melancholia and epilepſy have been cured by inoculation for the itch.* Eruptions and burns have frequently ſuſpended epilepſy and relieved fatuity.* A caſe of herpes, cured by the eruption excited by the Rhus radicans, is related by Freſnoy. (See the Appendix.)

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* Inſtances of this are related by Drs. Muntzell and Zimmermann.

In certain ſtages of mania, melancholia and pulmonary conſumption; in epilepſy, palſy and other chronic diſeaſes, which for a long time had reſiſted the effects of powerful remedies; in habits that are acted upon by the Rhus radicans or Vernix, I ſhould not heſitate to excite an univerſal cutaneous eruption; by means of the poiſon of theſe plants. There appears to be conſiderable ground, for a reaſonable ſuppoſition, that at leaſt in ſome inſtances, this treatment would remove a diſeaſe or palliate its ſymptoms.

A diſſertation has lately been publiſhed by Dr. I. Alderſon of England, on the Rhus toxicodendron, which he particularly recommends in paralytic affections; (as appears from Darwin's Zoonomia.)

From one to four grains of the powder of the dried leaves, are to be taken three or four times a day. I have not had an opportunity of ſeeing this diſſertation.

One treatiſe only has hitherto been publiſhed on the medical properties of the Rhus radicans. It is entitled: Des propriétés de la plante appelée Rhus Radicans. De ſon utilité et des ſucces, qu'on en a obtenu pour la guerison des Dartres, des affections Dartreuſes, et de la Paralyſie des parties, inférieures.

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* A caſe of epilepſy, cured by the ſmall pox, is related by Dr. S. Cooper, in his Inaugural Diſſertation on Stramonium.

Par M. Du Freſnoy, M. D. 1788. Dr. Du Freſnoy was led by accident to the employment of this vegetable in herpetic eruptions. The caſe which firſt ſuggeſted to him its uſe, is curious; it is related in the appendix. Before he exhibited the Rhus radicans to other perſons, Du Freſnoy aſcertained its doſe by experiments made upon himſelf. Perceiving no effect from taking an infuſion of one of the leaves of the plant, he gradually increaſed the number of leaves for each infuſion, to twelve. "At this doſe, he ſays, I obſerved a ſlight pain in my ſtomach, and my perſpiration and urine were increaſed in quantity."

He relates ſeven caſes of obſtinate herpetic eruptions, which had reſiſted ſeveral powerful remedies, but which were cured by the infuſion of the diſtilled water of the Rhus radicans. After aſcertaining the good effects of this vegetable, in the cure of herpes, he met with a caſe of palſy, which was aſcribed to the ſuppreſſion of an herpetic eruption;* he exhibited the extract of the Rhus radicans, and by this remedy, continued about two months, ſucceeded in curing his patient.

The ſucceſsful iſſue of this caſe, ſuggeſted the employment of the extract of the Rhus radicans in ſeveral other caſes of palſy, four of which were cured,

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* Soupçonnant donc que l'humeur Dartreuſe pouvoit bien être la cauſe de ſa *Paralyſie*, je crus devoir ſaiſir cette occaſion d'eſſayer l'extrait de *Rhus Radicans*.

by this remedy. Theſe caſes are related in his treatiſe, with great accuracy and minuteneſs.

Du Freſnoy, from the fortunate event of the caſes juſt mentioned, is led to conſider the Rhus radicans as a ſpecific for thoſe paralytic affections of the inferior extremities, which ſucceed convulſions: " Je ne crois pas devoir héſiter a préſenter le Rhus radicans, comme un ſpécifique pour la *Paraplexie*, ou Paralyſie, des extrémités inférieures, lorſqu'elle eſt la ſuite des mouvements convulſifs." He mentions in his treatiſe three ſpecies of this diſeaſe: palſies of the upper extremities; palſies in conſequence of apoplexy, and palſies which follow convulſions. In the two former ſpecies he did not ſucceed with this remedy.[*]

It is ſomewhat difficult to conceive, according to our preſent ideas of this diſeaſe, that in palſies which affect different parts of the body, the ſame remedy ſhould produce ſuch different effects. It would have been deſirable, if Du Freſnoy had related more definitely the ſymptoms and habits of thoſe patients in whom the remedy failed. Does he conſider paralytic affections of different parts of the body as eſſentially different, and depending on different cauſes? Many trials yet are neceſſary, before we can draw a certain concluſion concerning the uſe of this remedy in palſies. Much credit however, is due to Dr. Du Freſnoy for this diſſertation; he appears to be candid in the relation of his caſes, his remarks are made with caution, and indicate great accuracy of obſervation.

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[*] " Il y a des Paralytiques qui ont eu le courage de prendre de l'extrait de Rhus-radicans, juſqu'à la doſe d'une once, trois fois le jour, ſans en reſſentir le plus léger effet.

The uſual doſe of the extract, will appear from a caſe related in the appendix. It is generally requiſite, in order to derive benefit from it, to exhibit it in large doſes. From two grains to ſeveral drams three or four times a day, have frequently been given by Dr. Freſnoy.

APPENDIX.

A. Deſcription of the *Rhus Vernix* of Japan: extracted from Kæmpfer's Amœnitates Exoticœ, pag. 791, 2 & 3.

Sitz, vel *Sitzdſjù*, i. e. *Sitz* planta, vulgo *Urùs* seu *Urus no ki*. Arbor vernicifera legitima, folio pinnato Juglandis, fructu racemoſo ciceris facie.

Arbor paucis ramis brachiata, ſalicis ad altitudinem luxurioſe exſurgit. Cortice donatur incano, ex verruculis ſcabro, facile abſcedente; *ligno* ſaligneo fragillimo; *medulla* copioſa, ligno adnata; *Surculis* longis craſſis in extremitate inordinate folioſis. *Folium* eſt impariter pennatum, ſpithamale vel longius, Juglandis folio æmulum, coſta tereti, leviter lanuginoſa; quam a ſemipalmari nuditate ſtipant lobi ſive folia ſimplicia, pediculo perbrevi nixa, tenuia, plana, ovata, trium vel quatuor unciarum longitudinis, baſi inæqualiter rotunda, mucrone brevi anguſto, margine integro, ſuprema facie obſcure viridi, lævi, et ex nervis lacunoſa, dorſo incano et molliter lanuginoſo. Nervus medius in mucronem terminans ſubinde multos a latere demittit nervos minores, citra marginem deficientes. Sapor folio ſylveſtris ineſt, cum ſenſibili calore; humor affrictus extemplo chartam ferrugineo colore imbuit. In ſurculis quibusdam ex foliorum axillis ſinguli ſurgunt *Racemi* laxe ramoſi, palmares, tenues, qui, petiolis in calyculos rotundos deſinentibus, *Floſculos* continent pumilos, et citra Coriandri ſeminis magnitudinem radiantes, in luteum herbaceos, pentapetalos, petalis carnoſis nonnihil oblongis et repandis; ſtaminibus ad petalorum interſtitia ſingulis, apicatis, breviſſimis, ſtylo perbrevi tricipite, floris turbini inſidente. Ordorem ſpirant dulcem, Aurantio flori affinem et pergratum. *Fructus* floſculum excipit gibboſus, utcumque in rhomboidis figuram compreſſus, bifidus, facie ac magnitudine ciceris, membranula tenui micante veſtitus, per maturitatem duriſſimus et obſoleti coloris.

Cortex arboris cultro crenatus lacteum fundit lentorem, humore cryſtallino (ex aliis ductibus ſtillante) permixtum, qui ad aëris contactum nigreſcit Eundem ſurculi divulſi, foliorum pediculi, et nervi produnt, nullius guſtabilis qualitatis participem, niſi calefacientis ſine acredine. Venenatos tamen ſpiritus hæc arbor exhalare dicitur, vehementes adeo, ut pueris circa eandem commorantibus exanthemata in corpore pariant: qualia etiam lignum tractantes alii (non omnes) experiuntur. Collectio *Uruſj*, ſive Vernicis, ut inſtituatur, caudices præcipue triennes, paucis crenis vulnerandæ ſunt, ex quibus ſtillans liquor ſubinde excipitur, iterata in recente loco ſectione, donec exſucci marceſcant. Emulſi atque omni ſucco orbati, illico amputandi ſunt; ſic nova e radice provenit ſoboles, quæ triennis facta, collectioni denuo ſubjicitur.

B. The following intereſting caſe was obligingly communicated to me by *Dr. Charles Caldwell*

Philadelphia, April 16th. 1798.

Dear Sir,

"In the ſummer of ninety-ſeven T— L—, a boy of about twelve years old, and poſſeſſing a very high degree of what is denominated a melancholic temperament, was expoſed to the action of the Rhus radicans. I am unable to ſay whether or not he handled the leaves of the plant, or was only ſubjected to the contact of the effluvia which it emits.

As circumſtances render it probable that our patient was expoſed, for ſeveral days in ſucceſſion, to the action of this poiſon, it is impoſſible to tell what length of time elapſed after he had actually received the infection, (for ſo I ſhall term it) previouſly to the commencement of the diſeaſe which it produced. The following is a brief ſketch of the firſt appearance and ſubſequent progreſs of the ſymptoms of his illneſs.

The diſeaſe was uſhered in by an atack on his hands and face, which were affected with an eruption accompanied by ſome degree of redneſs and ſwelling. A fever ſucceeded, attended by unuſual drowſineſs, ſome thirſt, and conſiderable conſtipation of the bowels. The fever continued for ſeveral days, during which time the eruption ſpread gradually over his whole body, in a manner, as well as I recollect, much reſembling the progreſs of the inoculated ſmall-pox. A ſwelling and very troubleſome itchineſs accompanied the eruption through the whole of its courſe.

The exact term during which our patients febrile ſymptoms continued I do not now recollect. In aboutten or twelve days from the commencement of his attack the eruption had, in a great meaſure, diſappeared from his hands and face, and continued to die away on the other parts of his body in the ſame gradual manner in which it firſt made its appearence. So ſevere and painful was the affection on his lower extremities, that for ſeveral days he was unable either to ſit, walk or ſtand without experiencing much diſtreſs.

During the courſe of his illneſs he was bled twice, kept cool and quiet, and took two or three doſes of purgative medicines. Of the exact appearance of his blood I am not able to inform you, having had no opportunity of ſeing it after it was drawn. By thoſe who examined it, it was ſaid to be *very bad*, from which I think it probable that it was marked with an appearance of ſize. This, however, I advance only as a matter of ſuppoſition. — What, or whether any external applications were uſed, I do not now with certainty remember; for I was not the attending phyſician, but only an occaſional viſitant in the family.

From the foregoing ſtatement it would appear, that the poiſon of the Rhus radicans acts in a manner ſomewhat ſimilar to the contagion of the ſmall-pox when communicated to the ſyſtem through the medium of inoculation. In the caſe of T— L—, the hands and face having been expoſed naked to the poiſonous effluvia, may be conſidered as the immediate ſeat of inoculation. Theſe accordingly became firſt diſordered, by a topical eruption. In a ſhort time a fever ſupervened, and the eruption extended to the other parts of the body, in a manner anologous to the inoculated ſmall-pox.

If the foregoing communication can avail you any thing in your preſent intereſting inveſtigation, I beg you to conſider it entirely at your command, and to give me credit for the ſincerity with which I have the pleaſure to be

Your friend and

Very humble ſervant,

CHARLES CALDWELL.

C. An account of the caſe which ſuggeſted to Dr. *Du Freſnoy* the exhibition of the Rhus radicans in herpetic affections.

A young man, he firſt informs us, had voluntarily rubbed his hands with the leaves of the Rhus radicans: the ſucceeding day, he perceived an eruption on his hands, which he miſtook for the itch. He then proceeds: " Le lendemain les mains & les poignets, dont le gonflement avoit augmenté la nuit, étoient couverts d'une

grande quantité de petites véſicules, qui ſe remplirent en groſſiſſant de plus en plus pendant ſept ou huit jours, d'une ſéroſité jaunâtre, qui annoncoit un éréſipèle fâcheux. Malgré les ſaignées, les bains, les fomentations émollientes & les boiſſons délayantes, la tête s'enfla ſi fort, qu'il fut aveugle, par le gonflement prodigieux des paupières, pendant plus de vingt-quatre heures. Les démangeaiſons ſe portèrent enſuite ſur toutes les parties du corps, principalement les chevelues & celles de la *génération* qu'il ſe mit en pièces à force de ſe gratter. Au bout de dix jours, les accidens ceſsèrent, les poignets, qui avoient jeté une grande quantité de ſéroſités, ſe dépouillèrent de leur épiderme. Il fut fort étonné de ſe voir guéri d'une *Dartre* qu'il portoit au poignet depuis plus de ſix ans, & qui avoit éludé les frictions, le ſublimé corroſif à la plus haute doſe, & les remèdes preſcrits par les perſonnes de l'Art les plus éclairées de la Province. Depuis, cette Dartre n'a plus reparu.

Mr. Du Freſnoy's diſſertation on the Rhus radicans.

D. Account of a caſe of palſy which ſupervened in conſequence of an herpetic eruption, and which was cured by the extract of the Rhus radicans. From *Freſnoy's* diſſertation,

" L'objet de la premiere obſervation étoit un jeune homme, âgé de 14 à 15 ans, Perruquier de ſon métier. Le 7 Janvier je fis prendre au malade, deux grains d'extrait en bol, quatre fois le jour, à ſept heures & à dix du matin, à quatre & à neuf heures du ſoir.

Le 8, ſix grains quatre fois le jour.

Le 9, dix grains.

Le 10, ſeize grains.

Le 20, vers le ſoir, le malade a commencé à remuer très-légèrement les doigts du pied. J'ai ſucceſſivement augmenté les priſes d'extrait, de ſix grains par jour, juſqu'à ce que je fuſſe parvenu à la doſe d'un gros par priſe; doſe à laquelle je me ſuis tenu pour ce malade, juſqu'à parfaite guériſon.

Le 14, il a levé la jambe.

Le 16, il a remué les doigts de la main, & s'eſt tenu ſur les jambes, étant ſoutenu par les bras.

Le 24, il a marché, ſoutenu par la main.

Le 27, il ôtoit ſon bonnet, de la main malade.

Le 2 Février, il marchoit à l'aide d'une canne.

Il a toujours continué d'aller de mieux en mieux. Quand il eſt ſorti de l'Hôtel-Dieu (le 14 Mars), il mettoit des papillotes, accommodit les cheveux & raſoit, à peu-près auſſi aiſément qu'avant ſon accident. Il paroiſſoit ne lui reſter d'une maladie auſſi grave, qu'une légère difficulté dans les mouvemens du bras malade, qu'il n'avoit point avant ſon Hémiplégie,

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